

ANNUAL REPORT FOR 1935

Northern Rocky Mountain Forest and Range Experiment Station  
Missoula, Montana



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# INVESTIGATIVE COUNCIL

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years. Representatives of all the research agencies within the Region were present at the meeting.

### Attendance

Attendance at the 1934 meeting was larger than it has been for many years. The individuals listed below attended all or part of the sessions.

### Forest Service, Region One

B. W. Kelley	Regional Forester and Chairman
Elmer Koch	Forest Management
Philip Hoff	" " (Logging Engineering)
Ferry Hallis	" " (Planting)
J. E. Fox	" " (In charge, Savenac Nursery)
G. A. Smith	Range Management
Tom Larsson	" "
Elmer E. Luer	" "
Fred Leftwich	" "
E. E. Dinselle	Game Management
H. E. Wolff	Land
H. M. Gurley	Land
G. E. Mollarg	State and Private Forestry
G. O. Strong	Operation
T. Stormaker	Fire Control
H. E. Swan	Public Relations
H. B. Myrick	Forest Supervisor (Lolo)



## INVESTIGATIVE COUNCIL

The meeting of the Regional Investigative Council for the Northern Rocky Mountain Region was held at the University of Montana Forest School, Missoula, Montana, on March 12 and 13, 1936. As no formal annual meeting was held in 1935, reports by the different research agencies covered the progress made during the past two years. Representatives of all the research agencies within the Region were present at the meeting.

### Attendance

Attendance at the 1936 meeting was larger than it has been for many years. The individuals listed below attended all or part of the sessions.

### Forest Service, Region One

B. W. Kelley	Regional Forester and Chairman
Elers Koch	Forest Management
Philip Neff	" " (Logging Engineering)
Peroy Melis	" " (Planting)
J. W. Fox	" " (In charge, Savenac Nursery)
G. A. Smith	Range Management
Tom Lemmasson	" "
Elmer E. Luer	" "
Fred Leftwich	" "
J. K. Dwinelle	Game Management
M. H. Wolff	Lands
H. H. Curley	Lands
C. K. McHarg	State and Private Forestry
O. O. Strong	Operation
T. Shoemaker	Fire Control
H. J. Swan	Public Relations
E. H. Myrick	Forest Supervisor (Lolo)



Office of Forest Pest Control, Spokane, Washington

Forest Service, Northern Rocky Mountain Experiment Station

L. F. Watts	Director and Secretary
L. G. Hornby	Silviculture
R. H. Weidman	Silviculture
J. B. Thompson	Supt. Priest River Exp. Forest
L. C. Hurtt	Range
L. Ellison	Range
H. T. Cisborne	Fire
I. V. Anderson	Forest Products
C. N. Whitney	" "
E. F. Rapraeger	" "
M. Bradner	Forest Survey
C. M. DeJarnette	" "
T. Rowland	" "

In addition to the above regular members of the Station staff, all (20) of the emergency technicians and assistant technicians attended all or part of the sessions.

University of Montana

T. C. Spaulding	Dean, School of Forestry
I. W. Cook	Professor, " "
F. C. Clark	" " " " " "
E. W. Nelson	" " " " " "
J. H. Ramskill	" " " " " "
C. W. Waters	Botany Department
J. W. Severy	" " " "

University of Idaho

D. S. Jeffers	Dean, School of Forestry
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State Foresters

A. J. Peary	Idaho State Forester
Rutledge Parker	Montana State Forester

Montana Agricultural Experiment Station

M. H. Saunderson	Professor, Montana State College
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U. S. Weather Bureau - Missoula

B. P. Hughes	In charge, Station
Ralph T. Hanna	Fire Weather Forecasting



Office of Blister Rust Control, Spokane, Washington

H. B. Swanson      proved Acting in charge  
Bureau of Entomology, Coeur d'Alene Field Station in

J. C. Evenden      Director out so heavily in

Soil Erosion Service      uncertainty of funds for carrying

G. R. McDole      Pullman, Washington

C. Svendby      " "

S. L. Sloan      Great Falls, Montana

O. L. Anderson      " "

National Park Service

E. T. Scoyen      Supt. Glacier National Park

J. F. Aiton      Fire Control, Glacier National Park

Maynard Barrows      Yellowstone National Park

F. D. LaNoue      Game Management, Yellowstone National Park

of financed. On the other hand, the N.R.A. funds made

U. S. Indian Service

C. D. Faunce      Forester, Flathead Indian Agency

G. I. Garin      " " "

H. P. Smith      material progress on such jobs as improvement thinnings,

U. S. Biological Survey

Robert S. Norton      In charge, National Bison Range, Moiese, Montana.

State Planning Boards

George Weisel      State Planning Engineer, State of Montana.

amount of the various emergency funds allotted, material

Private Agencies

S. J. Pauly      Montana Woolgrowers, Deerlodge, Montana.

L. S. MacDonald      Northern Pacific Ry. Agricultural Del. Dept.

all of the agencies in the Region for the calendar year,

1935.



## Extent of Research by all Agencies

The past year proved to be one of reduction in emergency allotments with practically no increases in the regular appropriations which were cut so heavily in 1933. The continued uncertainty of funds for carrying out the many projects underway prevented any constructive planning. The allotment of E.C.W. research money to the Station in monthly installments greatly lessened the efficient use of such funds during the field season.

E.R.A. funds made available in August, 1935, were so restricted as to employment and wages that qualified technical help for research projects could not be hired or financed. On the other hand, the E.R.A. funds made it possible to construct and maintain a considerable number of improvements on experimental areas and made material progress on such jobs as improvement thinnings, slash disposal, snag felling, stand sanitation work, planting, seeding, and control work all of which can be accomplished with common labor.

As a whole, considering the reduction in the amount of the various emergency funds allotted, material progress was made by all of the research agencies within the Region. The table which follows gives the number of research projects and expenditures by lines of work for all of the agencies in the Region for the calendar year, 1935.



NUMBER OF RESEARCH PROJECTS AND EXPENDITURES, BY LINES OF WORK.  
Northern Rocky Mountain Region  
Calendar Year 1935

Line of Work	AGENCY															2/		
	Bu. of	Univ. of	Univ. of	Soil Cons.	Yellowstone	Weather	Ver. Ser.	N.R.M.						Totals				
	Entomology:	Idaho	Montana	Service 1/	Nat'l Park:	Bureau	Region 1:	Exp. Station										
	No.:	Amount:	No.:	Amount:	No.:	Amount:	No.:	Amount:	No.:	Amount:	No.:	Amount:	No.:	Amount:	No.:	Amount:		
Artificial Reforestation:			6	625			1	80			1	5138	2	1,992	10	5,805		
Influences			1	150			1								1	150		
Management			5	1055									4	53,417	9	54,472		
Nomenclature													3	7,861	3	7,861		
Protection	10	13,000					2	1,096	1	3,000			2	51,969	15	49,065		
Products			3	2,500	1	105							5	9,214	7	11,819		
Grazing												4	870	1	27,023	7	29,368	
Wild Life							2	4,390			1	342			3	4,732		
Management																		
Artificial Reseeding													1	5,094	1	5,094		
Economics													1	109,893	1	109,893		
Ecology					1	735		1	100						2	835		
Miscellaneous:								2	3,310					4	5,110	6	6,420	
Totals	10	13,000	3	2,500	16	4145		8	8,946	1	3,000	6	4350	21	229,573	65	265,511	

- 1/ Impossible to make estimate. No research work done although considerable amount of work is more or less experimental.
- 2/ Amounts shown cover expenditures during F.Y. 1935.
- 3/ \$2100 of this figure is the estimated amount of ECW expense by the Bureau of Plant Industry on this project.



a number of improvements Matters of General Interest planted trees

on experimental areas and in the arboratum, and assisted

### Civilian Conservation Corps

in many other improvements and research projects.

A large amount of worthwhile work was accomplished by the C.C.C. camps allotted to the Station. One entire 1935 winter work period the entire enrollment and funds of the Priest River camp were allocated to the Priest River Experimental Forest. A heavy station construction and improvement program was initiated. A new sewage system out the fifth work period on the Coram Forest. The Priest River camp starting early in the fifth work period continued as a winter camp through the sixth period. A heavy station construction and improvement program was initiated. A new sewage system out the fifth work period on the Coram Forest. The Priest River camp starting early in the fifth work period continued as a winter camp through the sixth period.

Worthwhile work along many lines was accomplished period. Construction was started on a new superintendent's dwelling, a new laboratory and office, and a new four-room cottage. The superintendent's dwelling and the four-room cottage should be completed by late spring. Funds are insufficient to completely finish the new laboratory and ways. Twenty-five C.C.C. enrollees enlisted from the University of Idaho and split equally between the Priest River and Deception Creek camps did much of the necessary remainder of the camp's enrollees not occupied with Station project work under the direction of project leaders.

Other enrollees under the direction of carefully selected technicians established thinning and stand improvement of old burns to reduce the fire hazard and fireproofed and cleaned up a number of miles of new roadside. This work is plots, felled snags to reduce fire hazard, disposed of being continued.

the slash and carried out sanitation measures on sale areas, fire-proofed and cleaned up many miles of roadside, assigned during the entire past year for office work at completed blister rust and insect control work, accomplished the Station headquarters in Missoula.



a number of improvements on Station grounds, planted trees on experimental areas and in the arboretum, and assisted in many other improvements and research projects.

During the sixth or (October 1, 1935 to March 31, 1936) winter work period the entire enrollment and funds of the Priest River camp were allocated to the Priest River Experimental Forest. A heavy Station construction and improvement program was initiated. A new sewage system for the headquarters was constructed, a new gasoline house erected, an addition made to the workshop, and a new woodyard and wood-saw setup built during the sixth work period. Construction was started on a new superintendent's dwelling, a new laboratory and office, and a new four-room cottage. The superintendent's dwelling and the four-room cottage should be completed by late spring. Funds are insufficient to completely finish the new laboratory and office, but it will be put in such shape by late spring that it will be entirely weather-proof and useable. The remainder of the camp's enrollees not occupied with Station construction and improvements treated a considerable area of old burns to reduce the fire hazard and fireproofed and cleaned up a number of miles of new roadside. This work is being continued.

From five to fifteen selected C.C.C. boys were assigned during the entire past year for office work at the Station headquarters in Missoula.



Definite information has just been received that C.G.C. camps F-127 Priest River Experiment Station, and F-137 Deception Creek, will remain for the seventh or spring-summer work period. The two supervisors concerned have given the work assignments for these two camps a high priority rating and it is expected that a very generous percentage of the enrollees will be allocated to Station work. The fact that two camps, out of a total regional allocation of but 31 Forest Service camps, have been assigned to work on experimental areas is an excellent example of the splendid cooperation extended by our Regional Forester.

#### Emergency Relief Administration

A total of 588 man months of E.R.A. labor was allotted to the Station for the period July 9, 1935 to July 9, 1936. E.R.A. crews varying in size from 10 to 50 men were established at the Priest River, Deception Creek, and Coram Experimental Forests, the Vigilante and Fort Keogh Experimental Ranges, and Station headquarters at Missoula. Up until January 1, 1936, 376 man months of the original allotment had been used. With this labor material progress was made in many lines of work. The relief rollers under the direction of carefully selected technicians, called ten-percenters, accomplished a number of improvements at Station headquarters, fire-proofed and cleaned up roadsides, disposed of slash and



did sanitation work on experimental sales, established thinning and stand improvement plots, aided in research work on the Experimental Ranges, made fence posts and poles for the newly established Vigilante Experimental Range, did maintenance work on many miles of trails, and did office compilation and map coloring at the Missoula headquarters. Savings made over and above wages, equipment purchases and rentals, and expenses have made it possible to aid materially the building programs at a number of the field stations. Some difficulty was encountered at the start of the program in obtaining the full quota of workers from certain counties. This difficulty was overcome by the authorization to disregard, where necessary, county lines. As a whole, the class of labor recruited has proved quite satisfactory.

The original allotment will have been used up at most of the field stations considerably before June 30, 1936. Recently the possibility of obtaining additional quotas of E.R.A. funds for the period March 1 to June 30, direct from the States has developed. The Station could use effectively and has estimated for an additional quota of 379 man-months under this setup.

The fundamental purpose in location of these utilization roads is elimination of chutes and in some places tractor logging and substitution of direct skidding and motor



truck handling. Preliminary written plans and maps have  
National Youth Administration  
been prepared for these three forests and the roads

In December, 1935, the Forest School at the University of Montana offered the work time of a number of undergraduates who were being helped financially out of the University's N.Y.A. allotment. Ten students were selected and distributed for work assignments among the several divisions. Although the number of hours that the student is permitted to work is limited, most of the boys are available for two afternoon's and one morning's work each week. The arrangement with the University was made on the assumption that a good share of the benefit to the Station would be in the training of the students and the familiarity they would gain with Station work. The students have, however, done a lot of effective work considering the limited hours they are on the job.

Road Planning for Utilization of  
Timber on Experimental Forests

Planning for utilization roads on the Deception Creek, Priest River, and Goram Experimental Forests is included in research project "Logging and Milling".

Protection and administration needs are, of course, given consideration concurrent with utilization needs. The fundamental purpose in location of these utilization roads is elimination of chutes and in some places tractor logging and substitution of direct skidding and motor



truck hauling. Preliminary written plans and maps have been prepared for these three forests with the roads

located so average skidding distances on merchantable timber areas will be approximately 500 feet with a maximum allowable distance of 1,000 feet. The total volume of merchantable-sized timber involved is 168 million feet divided as follows:

Coram Experimental Forest	93 million feet
Deception Creek	45 "
Priest River	30 "

Quantitative accomplishments in road construction and planning is best expressed by the following tabulation:

Experimental Forests	R. of W.		Total road		Total road
	completed	all ready for	mileage not constructed	but tentatively planned for construction	
Season of 1938	machine work	next season	to date		sum of columns 4 and 5
	(1)	(2)	(3)	(4)	(5)
Deception Creek	4.7	2.8	17.8 <sup>1/</sup>	21.0	38.8
Coram	none	3.9	9.1	49.4	58.5
Priest River	4.7	none	22.5	21.0	43.5
Total	9.4	6.7	49.4	91.4	140.8

1/ Includes three miles of main line utilization road serving Coeur d'Alene National Forest.

Approximately 40 percent of the proposed roads are of a secondary nature and need not be constructed until just prior to logging.



outside of these PROGRESS BY LINES OF WORK Planned  
use of the DURING 1935 AND PLANS FOR F.Y. 1937 important

Forest Survey

The Forest Survey organization of this Station has planned as its first unit, to cover the Inland Empire region of the Pacific Northwest. The project will eventually include all of Region One of the Forest Service. The Inland Empire region includes Montana west of the Continental Divide, Idaho north of the Salmon River, and Spokane, Stevens, and Pend Oreille counties in northeastern Washington. Within this unit there are approximately 26 million acres of forest land to be covered by the Survey. The Inland Empire is primarily a forested region, approximately 78 percent of its gross area being forest land. Lumbering and mining are the foremost industries within the region and many of the communities are entirely dependent upon the forests for their support. Cutting of the accessible forests has gone forward at such a rate that in some sections of the region sustained yield management under the present mill setup is already impossible. Forest fires have taken a heavy toll of the future timber supply and in parts of the region epidemic insect losses have been heavy. Profitable agriculture is limited to relatively narrow valleys and adjacent bench lands, and most attempts at farming in the cutover lands consists of checking the collected cruise estimates in the



outside of these areas have been unsuccessful. Planned use of the land is becoming an increasingly important problem.

Collection of cruise data for the Survey was started in January, 1932. Field work on a small scale was initiated in May, 1932. Since that time, the work has progressed on a fluctuating scale, both in the field and office. In 1933 a total of six field mappers were employed for part of the season. During the summer of 1934, an average of 30 men mapped in the field and cruised, and about the same number were employed on office compilation during the winter and spring of 1935. During the 1935 field season, 17 men mapped in the field, 3 men worked on the growth phase, 3 men on an insect loss survey, and 2 men worked on the requirements phase. During the winter about the same number have been engaged on office work.

On the accompanying tabulation, under the heading "Percentage of Job Completed", are listed the four major divisions of the work of the Inventory Phase of the Survey. "Collection" represents the work of assembling and sorting the cruise information available from the various sources. "Field Mapping" is the work of covering areas for which no satisfactory information is obtainable and supplying missing data such as age and site, on areas of mature timber where volume data alone have been obtained. "Adjustment Cruising" consists of checking the collected cruise estimates in the



Unit	Est. Area Forest Land in M. Acres			Percentage of Job Completed					Report
	Inside N. Forests	Outside N. Forests	Total	Collection	Field	Adj.	Office		
					Mapping	Cruising	Compilation		
IDAHO									
Benewah	16	388	404	100%	100%	100%	95%		
Bonner	446	649	1,095	100%	100%		65%		
Boundary	417	338	755	100%	100%		10%		
Clearwater	641	867	1,508	100%	100%		30%		
Idaho	3,490	445	3,935	100%	90%		5%		
Kootenai	202	423	625	100%	100%		95%		
Latah	31	400	431	100%	100%		95%		
Lewis		114	114	100%	100%		10%		
Nezperce		125	125	100%	100%		10%		
Shoshone	977	634	1,611	100%	100%	100%	55%		
TOTAL IDAHO	6,220	4,583	10,803	100%	96%	19%	35%		
MONTANA									
Deerlodge	60	15	75	90%					
Flathead	1,843	1,123	2,966	100%	30%		15%		
Granite	620	133	753	75%					
Lake		442	442	90%	25%				
Lewis & Clark	140	80	220	90%					
Lincoln	1,655	624	2,279	100%	85%		75%		
Mineral	576	164	740	75%					
Missoula	567	833	1,400	85%					
Powell	515	390	905	95%					
Ravalli	928	153	1,081	80%					
Sanders	822	462	1,284	80%	25%		15%		
TOTAL MONTANA	7,726	4,419	12,145	90%	27%		19%		
WASHINGTON									
Pend Oreille	267	642	909	100%	100%		90%		
Spokane		559	559	100%	100%	100%	95%		
Stevens	64	1,642	1,706	100%	100%	80%	95%		
TOTAL WASHINGTON	331	2,843	3,174	100%	100%	61%	94%		
TOTAL INLAND EMPIRE	14,272	11,645	25,922	95%	64%	15%	35%		



Survey standards is needed. During the 1935 season the field, and adjusting them to a common standard. "Office Compilation" is the job of welding the mass of information obtained by collection and field work into a complete summary of volume and type area data for the entire acreage of forest land within the unit. The "Report" will be an economic discussion of the history and prospects of the timber industry within the counties involved.

The percentages as shown, give a fair picture of progress. Included in the time and money which have been spent on the project thus far, is a large amount for preliminary plans, training of personnel, development of methods and the purchase of cars and field equipment sufficient for an organization of thirty men. As the project advances, this investment is being realized on, and the percentages of coverage more nearly represent the true condition. The most difficult part of the unit has been completed with respect to the field mapping and compilation. The area covered includes the most broken type conditions, as well as some of the most valuable timber land in the region. The latter class of land naturally deserves more careful consideration than the rough back country areas included in the National Forests. On a large part of the back country, there is already sufficiently accurate coverage and very little, if any, adjustment to Forest



Survey standards is needed. During the 1935 season the 5,600,000 acres mapped included a large percentage of this back country, and faster progress was made per man-month than in 1934. The information is being made available as called for. If the present crew can be continued, cover maps for all of the area which has been covered to date will be in final form by the end of this winter. Photostatic negatives are being made of each township. From these, either 1-inch or the 2-inch-to-the-mile reproductions may be made. The plain positive prints show timber and other cover data by lines and type symbols. Colored maps show the above in color, in addition to the symbols. These maps are available at cost for distribution to those having use for them in township units, in either size, upon order. The use of the information which has been gathered to date, shows a definite need for the survey data. The resettlement administration has used quite a large number of the 2-inch type maps for their preliminary examinations. Three National Forests are using the type maps in Management plan revision. The Idaho Planning board is now using the 1-inch-to-the-mile type maps and as much of the compilation as has been done for the area outside the National Forests in a project which will form the basis for a report on Forest lands to be considered under the Pullmer Act.



The Division of Lands in the Regional office is making use of the data as preliminary land examinations and as information covering exchanges and donations for large areas of lower grade lands. The information is being made available as called for whenever possible even at some delay to the progress of the project. It is felt that the information which we have is needed immediately if it is to serve its best purpose for the agencies involved and that the value through such use is greater than the cost to the project through the delay involved. In any use which is made of Survey type maps, it must be realized that the field work, and hence the resulting types, are necessarily of an extensive nature. The maps or other data are not suitable for use where detailed information is desired on lands of high value or for detailed information on small units such as forties or even quarter sections.

It is expected that the 1-inch-to-the-mile type maps will be used quite extensively. Age and site information have been omitted from these. Timber types are shown by size classes, i.e., seedlings and saplings, poles and sawlogs. Cutover and burned-over information is shown on these maps and cultivated land is separated from forest land. They therefore are a good picture of the general cover types of the Region, and are detailed enough for all ordinary purposes of Forest Management and Planning. region, will be made prior to June, 1933.



Considerable progress has been made on the depletion, growth, and requirements phases of the Survey in addition to the inventory work described above. Figures giving the average annual amount of depletion by cutting have been compiled for the entire Inland Empire Region. Information on the drain by cutting of commercial lumber, sawlogs, and other of the major forest products was compiled during the winter of 1934-1935. During the field season of 1935, additional information was obtained on the amounts of fuelwood, farm fence posts, poles and timbers, local mine timbers, and other minor forest products cut annually within the region. The fuelwood survey shows that the volume of all fuelwood consumed annually in Region One is nearly 632 million board feet or 1,283,000 cords.

This is equal to two-thirds of the average annual saw-timber cut in the same territory. Of the total amount of fuelwood consumed annually, approximately half or 312 million board feet is cut from green timber and represents the annual drain on the forest of the Region from that use. The fence post survey shows that there are 108,250,374 rods of fence within Region One. The average net fencing per farm is 1,692 rods. Approximately 7,900,000 posts are needed annually within the Region as replacements. A final report presenting the depletion by cutting data, separately by counties for the entire region, will be made prior to June, 1936.



Two E.C.W. Junior Foresters were employed throughout the entire 1935 field season on an insect loss survey. This field crew was under the direct supervision of the Forest Insect Field Station at Coeur d'Alene, Idaho. Data were collected on epidemic insect losses in approximately three-quarters of the forest area in North Idaho. These data were compiled during the winter office season of 1935-1936. The results will show the average annual insect loss, in volume by species separately for large river drainage units such as the Clearwater, St. Joe, St. Maries, and Selway. Lodgepole pine has undergone the greatest depletion of any species in these areas. The heaviest damage occurred on the Nezperce Forest where extensive stands underwent an epidemic during the period 1928 to 1935, which caused an average total loss of around 50 percent. As a general average, the losses expressed in percent of greenstand were heavier in white fir and in Douglas fir than in either ponderosa or white pine. A preliminary check was made of the fire statistics available and plans formulated for obtaining the average loss from this source. Figures on the annual loss in acreage by fires in the different timber types are available over a long period of years. Changes in the type itself and in the stocking of the stands burned over, however, vary greatly with the intensity of the fire. Damage studies are therefore necessary in order to the lumber required in their construction have been



collected. Field work on the rural timber requirements arrive at correction factors that can be applied to the survey has been completed. Records covering farm buildings, Forest Survey data. Some data on this phase were collected by the field mappers in 1934. During the field season of 1935, ten selected recent burns covering different timber types and intensity of fire, were carefully inspected on the ground and acreage and volume losses computed. The data collected during the past season and that already available, are being analyzed and compiled during the winter office season by an E.C.W. Junior Forester.

Funds were sufficient to do field work on only one of the several studies needed to furnish the Survey with data on the growth rates in old stands and on restocking areas and the probable future yields. During the field season a two-man crew under L. J. Cummings collected all the data necessary to compile larch-Douglas fir yield tables for the region. Office compilation of these data was made during the winter of 1935-1936, and the study was completed and a final report made.

Approximately 10 man months were spent during the calendar year 1935, on the Requirements phase of the Survey. Bills of materials for urban dwelling construction were tabulated and conversion factors showing the relation between cubic volume and lumber footage were computed. Bills of materials for use in determining the relation between different classes of farm buildings and the lumber required in their construction have been



collected. Field work on the rural timber requirements Butte mining district are very nearly in direct ratio to survey has been completed. Records covering farm building setup, wood fuel requirements, rods of fencing, and electric utilities information on total mileage of lines annual replacements were obtained by actual field canvass and annual timber replacements was collected from five of 405 farms. Additional data of this kind were obtained additional large companies not previously reporting. These from 60 farms by means of a questionnaire. From these data supplement that obtained from other large timber users, data, farm fence post requirements have been determined. During 1936, the conversion factors obtained from bills of Urban and rural requirements for fuelwood are being materials for urban construction will be applied to building computed from the data collected during 1935. Figures on records for the cities and towns sampled. Building volumes the total tonnage of lead-zinc ore mined and total forest obtained from farm schedules will be summarized and conversion factors computed. Reports showing total lumber one of the largest mining companies in the Coeur d'Alene district of Idaho. The total quantity of sawed lumber, prepared. The data collected on the timber requirements of the public utilities, local governments, highway commissions, and the other large timber users will be tabulated was found to be 3.69 board feet. Data on timber consumption and tonnage of coal produced by the coal mining companies at Roundup and Red Lodge, Montana, were obtained. Conversion factors showing the total quantity of wood used in various forms per ton of ore mined by the Anaconda Copper Mining Company in Montana had been previously computed. This report shows that the total quantity of wood used in various forms per ton of copper ore mined in the Butte district for the ten-year period 1923 to 1932, inclusive, was 20.51 board feet. The records show that during the past twenty-five years the annual wood requirements of the now dependent upon them. Revised methods of cutting and



Butte mining district are very nearly in direct ratio to the metal production. Under the heading of telephone and electric utilities information on total mileage of lines and annual timber replacements was collected from five and additional large companies not previously reporting. These data supplement that obtained from other large timber users. During 1936, the conversion factors obtained from bills of materials for urban construction will be applied to building records for the cities and towns sampled. Building volumes obtained from farm schedules will be summarized and conversion factors computed. Reports showing total lumber requirements for both urban and rural buildings will be prepared. The data collected on the timber requirements of the public utilities, local governments, highway commissions, and the other large timber users will be tabulated and analyzed.

### Forest Products

In 1935 the lumber industry of Region One (Montana, North Idaho, and northeastern Washington) furnished payrolls amounting to over nine million dollars. Perpetuation of an industry making such a substantial contribution to the welfare of the communities of the Region is most important. Private timberlands furnishing over 60 percent of the raw material for this industry are in most cases being clear cut with no thought for the social and economic stability of communities now dependent upon them. Revised methods of cutting and



utilization standards based upon accurate information on production costs and net returns are an integral part of the program necessary to place sound forestry practice on these lands. Forest Products research aims to develop and make this information available.

#### Scope of Work

At present the Forest Products research program of the Northern Rocky Mountain Experiment Station is carried on under three major lines of endeavor.

##### 1. Production Costs and Utilization Investigations.

- a. Logging and milling studies.
- b. Species utilization.
- c. Woods and mill utilization.

##### 2. Statistics of Production, Consumption, and Distribution of Forest Products.

##### 3. Investigations of Wood Treatments, Coatings, Paints, Glues, and Laminated Construction.

#### Resume of Projects

Logging and milling studies receive the most emphasis in the production cost group of studies. They are designed to furnish information on (1) cost of growing stumpage suitable for sawlogs, ties, mining timbers, etc., (2) production costs and market values when the various tree species found in each commercial forest type in the Region are utilized for lumber and other commodities. Data from eight studies are now available.



The principal aim during the coming year will be completion of a rather comprehensive study in the white pine type involving all phases of match manufacture from the stump to the finished match. This project has been assigned to Associate Forester Rapraeger whose assignment to the Station was effective August 15, 1935. Rapraeger has had considerable experience in logging and milling studies in the Pacific Northwest and will devote most of his time during the next year to the white pine project. A phase of the logging output studies will also be included in a study designed to develop a complete utilization road system for each of our Experimental Forests which will facilitate direct skidding to motor trucks and eliminate ground skidding by horses and tractors over excessive distances.

The species utilization studies are designed to promote the good utilization of certain little-used species, thereby increasing the economic value of our present timber supply.

The woods and mill utilization studies furnish information pertaining to tree and log grades, overrun data, efficiency comparisons of milling equipment, waste investigations and depreciation studies. The results of previous studies on overrun, sawmill efficiency, residual wood after logging, breakage in felling and depreciation



through river driving, gravity chuting, and fire have been made available to the northwestern lumber industry.

Data secured under the statistics project are indispensable to other lines of research at the Station. Current data on production costs, selling values, and volume produced of all forest products cut in the Region are compiled annually and are now available back to 1912 for some commodities.

#### Useful Facts Developed

Cost data and other information resulting from the Regional wood-preserving studies have been widely used in treating telephone poles, fence posts, and stubs required in constructing and maintaining Forest Service improvements. The question as to whether material treated with Wolman Salts should be regularly accepted as an alternate to creosoted lumber, is a specific example. As a result of an inspection of the first run of lodgepole pine poles treated for an electrification project at the Remount Station, some recommended changes in the treating process applied to the first few poles put through the tanks, the entire lot will receive an effective butt treatment. Similar information covering the proposed treatment of several thousand fence posts, using E.R.A. labor this winter, was furnished the St. Joe Forest. Other Federal agencies, as well as some commercial companies and many farmers make use of the basic information obtained from these studies. Many of the costs in this vicinity are usually 10¢ per acre or less.



service test studies of telephone poles, stubs, fence posts, and ties have been under observation for a great many years and are providing the only reliable data that can be obtained on the durability of treated and untreated woods of various species in actual service and the efficiency of various preservatives and methods of treatment. The studies are being continued.

### Useful Facts Developed

Some of the more significant results and useful facts developed by Forest Products research at the Northern Rocky Mountain Station are:

1. Basic economic statistics on the production of forest products in the northwestern states indicate less lumber produced in Montana during the years 1931, 1932, 1933, 1934, and 1935 than any other year prior to 1898. The record high and low production was 428 million feet in 1923 and 112 million in 1932.

2. In connection with a logging and milling study in the western white pine stands of Idaho the necessity and value of protection from forest fires was accurately measured in dollars and cents. Four fires had occurred during the 135-year life of the trees. Cull butt logs to the amount of 2,200 feet per acre caused a loss in stumpage value of \$13.20 per acre to the present owner. Prorated over the life of the stand this amounts to approximately 10¢ per acre per year. Present fire protection costs in this vicinity are usually 10¢ per acre or less.



3. Current lumber selling values compiled by the Northern Rocky Mountain Station are used in the appraisal for sale of some 300 million feet of publicly-owned timber annually in the northwestern states. In 1935, the average wholesale lumber selling price of ponderosa pine was \$22.82 per thousand feet or 13 percent below the 1928 price.

4. Wood waste studies have indicated to lumbermen the actual amount of wood volume lost in converting trees to lumber. In Idaho, 20 percent of the cubic contents of each white pine tree is not used by the lumberman. In the tie operations of western Montana, 54 percent of the cubic contents of the average larch and Douglas fir trees are unutilized. Elimination of waste in exploitation of these species would contribute materially to the social and economic stability of local forest communities.

5. Selective logging studies have developed economic tree grades for ponderosa pine making accurate evaluation of standing timber possible. Individual sound ponderosa pine trees of similar size were found to vary widely in value of lumber produced. In a specific case, one 24-inch tree produced lumber valued at \$34.00 per M, contrasted to \$14.00 per M from another.

#### New Projects Proposed

No new projects are proposed. New projects instituted last year and limited personnel and funds preclude expansion at this time.



the research made plans, require several years of effort.

### Fire Research

The beneficial values of research results are always difficult to measure in dollars and cents. During 1935, however, the fire records for Region One, when compared to the character of fire season, showed a degree of efficiency which can be largely credited to the application of fire research results put into practice during the past few years. The fire records show that in the face of a fire season slightly more dangerous than average the fire control organization held costs plus losses to a total previously obtained only during very favorable fire seasons.

Although some of the credit certainly must be given to a larger and more flexible fire control organization, to more intensive training of employees, and to better supervision and inspection, the application of systematic fire control plans and the current measurements of fire danger undoubtedly were material factors in establishing the very creditable record for 1935. These fire control plans and the methods of measuring fire danger are both research products which have been rapidly put into practice by the administrative organization. But the full benefits are not yet apparent because the relocation of men and the construction of better-placed facilities, recommended by analysis.



the research made plans, require several years of effort. When fully applied these plans may be expected to give at the least 80 percent better forest protection without a material increase in the annual administrative costs. (2) the

Other outstanding results of fire research during the past year include the development of two new types of visibility meters, the correlation of fuel type with fire danger class to indicate rate of spread of fire, the testing of a fire extinguishing chemical which is definitely much more promising for forest fire control than any of the several chemicals previously tested, and in cooperation with the administrative organization, the successful development of ways of dropping food supplies, power pumps, gasoline, water, and chemicals from airplanes in flight to fire-fighting crews on the ground. A bulletin "Measuring Fire Weather and Forest Inflammability" was completed and is now in course of publication.

The most urgently needed fire research is the analysis of the Region One fire records for the period 1931-1935, inclusive. These records have all been punched and a detailed analysis would give much information to make future research more productive and less costly. With present funds, and since Hornby's transfer to Silvics research, the Station has no one available to make this analysis.



Other projects needing continuation, and for which present funds and personnel are inadequate, include (1) the development of proper methods of determining the relative value of stationary versus moving detectors, (2) the refinement of fuel type classifications so that these maps basic to all steps of fire control planning may be improved, and (3) the perfection of the most useful form of visibility meter.

All other unfinished fire research projects can be continued with the present personnel, and some expansion of the work with chemical extinguishers may be possible with financial assistance from the Washington Office of Fire Control.

#### Range Research

The 1934 drought continued with varying intensity in various parts of eastern Montana during 1935. Precipitation of 11.56" at Miles City in 1935 was more than

double that of 1934, yet was only 83.8 percent of normal remarkable uniformity on overgrazed, moderately grazed, and lightly grazed ranges with 70, 73, and 68 percent of records was experienced at Helena with 6.28" or only 46.1 percent of normal. Various other stations showed a range of from 70 to 80 percent of normal for the past year. These two dry years caused serious depletion of native ranges and provided a severe handicap to artificial range reseeding work.



Records for three full years are now available on the vegetation and on the three lots of breeding cows grazed at varying intensities under the project, Management of Short Grass Ranges, at Miles City. A comparison of all quadrats, 57 in number, that were charted in 1933 and again in 1935, shows a net reduction in density including all species and grazing intensities of 71 percent. Of the more important species the reduction ranged from 12 percent in the case of Carex to 75 percent for gramagrass and 79 percent for buffalo grass. Poa secunda was an outstanding exception to this decline that increased its density by 174 percent during the severe drought. No entirely satisfactory explanation can be offered for this great contrast. This poa completes growth in spring before the most serious effects of summer drought are felt, but this early development also characterizes Carex which declined very noticeably in density during the drought.

The reduction in total density has applied with remarkable uniformity on overgrazed, moderately grazed, and lightly grazed ranges with 70, 75, and 68 percent, respectively, of the 1933 quadrat areas. Supplemental data on plant development vigor and yield also fail to show any significant difference in the behavior of vegetation that has been grazed at three contrasting intensities for three years this experiment had continued. It must be concluded that drought is responsible for the



severe and relatively uniform decline in density of vegetation since no correlation or significant differences based on degree of grazing can be found in the data available. This tends to confirm the impression that short grass or vegetation is very resistant to heavy use. The range which is confined to an article is now almost ready for submission to a technical journal, such as Ecology, in which the effects of the 1934 drought on the vegetation of southeast Montana are presented in considerable more detail by Ellison and Woolfolk. In planning to restock ranges from which the effect of varying intensities on cattle production over the three-year period, however, is shown most strikingly from the fact that the calf crop has been 70, 86.7, and 76.7 percent, the average weaning weight 277.9, 321.3, and 326.3 pounds which when prorated to each of 20 cows averages 194.5, 278.4, and 250.1 pounds, respectively, for those on overgrazed, moderately grazed, and lightly grazed pastures. Fleming, et. al., reports that a range cow must produce approximately 250 pounds of calf weight on the average in order to yield a profit. The cost of a range at 10¢ per acre annually and of hay at \$6.00 per ton amounted to 5.58, 3.64, and 4.16 cents per pound of calf produced in the different intensities of use. Using the moderately grazed lot as 100 percent, the cost of feed for calf production on lightly grazed ranges was 114 percent and on overgrazed ranges 153 percent of this amount.



To date approximately 1,300 acres have been reseeded under this program, 150 acres of which were done in the fall of 1935, preliminary results for which will not be available until later. Results to date on the remaining 1,150 acres are noteworthy more from the fact that they offer proof that some success is possible with little or no soil preparation during severe drought years rather than from a high degree of success. Only 23 percent of the 1,150 acres for all species was considered successful based on conditions last fall. With 31 percent success on the 734 acres seeded to crested wheatgrass, mostly without prior soil preparation, this species has been more successful than any other species tried. The fact that fall seeded areas are classed as 39 percent successful as compared to 26 percent success on spring seeded areas indicates that fall seeding is preferable for crested wheatgrass under conditions that have prevailed during these tests.

Successful stands on 25, 7, and 3 percent of much smaller areas seeded respectively to slender wheatgrass, bromegrass and yellow sweet clover indicate that these are well worth further work. Harbin lespedeza also survived the drought on a small plot trial.

It is quite obvious that the private owner of the poorer grade range land cannot afford to use four pounds of crested wheatgrass at the prevailing price of 50 to 75



cents per pound plus labor and other costs with a 31 per-  
cent chance for success. On the other hand, if seed is  
reduced to 15 or 20 cents per pound there is every reason  
to believe that private owners can reseed during more  
favorable seasons a very large acreage of the better class  
range land that is plowed and abandoned in eastern Montana.  
One result of this project has been the fostering of a  
growing interest in reseeded by private owners and county  
agents in the counties where cooperative demonstration  
areas have been established.

A change from emergency to regular funds is highly  
desirable for this artificial reseeding work. Detailed  
research over a period of years as to the best time of  
seeding, depth of covering, spacing and rate of seeding,  
is needed before these and other questions can be  
authoritatively answered. Emergency funds are not satis-  
factory under such a plan.

Artificial regeneration; Planting stock,  
methods and survival.

Botany; Arboretum; Geographic Races; Phenology.

Station Accomplishments

Removal of Stands and Natural Regeneration

White Pine Reproduction Study

This group of studies, now in their tenth year, has

answered many of the pressing questions relative to white



pine establishment and survival. Three phases of the

### Silviculture

have been studied. (1) An intensive investigation

The Station's progress and proposed work will be

presented and then discussed in relation to a set of

questions prepared by the Regional Division of Forest

Management entitled "Silvicultural Questions for the

Experiment Station to Answer."

From time of planting to silviculture, including such

things as size and form of trees, the relation-

ship of trees and size of forest, and the relation

of trees and size of forest, and the viability of seed

stored in the duff for various periods. These will

The field of white pine silviculture was

reviewed a year ago. (3. Larch-fir) (4. Cedar)

survival studies, and the relation of seedling

ling development. b. Development of stands.

Publication (1) Reproduction, natural and weeded.

Controlling Initial Establishment in Western White Pine."

has been submitted to and accepted for publication by

the Yale University in connection of the requirements

for his doctorate. (2) Considerable work has been

done on Haig and Weidman's proposed U. S. Department of

Agriculture Technical Bulletin, "Natural Reproduction of

Western White Pine. (3) Manuscript is nearly completed

for publication. U. S. Department of

Agriculture Technical Bulletin, "Method of Cutting, and

Effect on Reproduction in the White Pine Type."

### Station's Investigative Projects

I Mensuration investigations, growth and yield.

II Silvicultural investigations.

A. In naturally regenerated stands.

1. Western white pine type (2. Ponderosa)

(3. Larch-fir) (4. Cedar)

a. Removal of stand and natural regeneration.

b. Development of stands.

(1) Reproduction, natural and weeded.

(2) Older stands, natural and thinned.

B. Artificial regeneration; Planting stock,

methods and survival.

III Botany; Arboretum, Geographic Races; Phenology.

### Station Accomplishments

Removal of Stands and Natural Regeneration

#### White Pine Reproduction Study

This group of studies, now in their tenth year, has answered many of the pressing questions relative to white



pine establishment and survival. Three phases of the problem have been studied. (1) An intensive investigation of the cause of seedling mortality during the first two years. (2) The rate of seedling establishment on areas cut over under various silvicultural methods and on various sites and exposures. (3) The history of the seed crop from date of flowering to germination, including such things as size and frequency of cone crops, the relationship of type and size of tree to cone production, the distance of seed dispersal, and the viability of seed stored in the duff for various periods.

The field of white pine silvicultural research was reviewed a year ago and due to completion of seedling survival studies emphasis was moved to problems in seedling development.

Publications. (1) Haig's bulletin, "Factors Controlling Initial Establishment in Western White Pine," has been submitted to and accepted for publication by the Yale University in completion of the requirements for his doctorate. (2) Considerable work remains to be done on Haig and Weidman's proposed U. S. Department of Agriculture Technical Bulletin, "Natural Reproduction of Western White Pine." (3) Manuscript is nearly completed for Haig and Wellner's proposed U. S. Department of Agriculture Technical Bulletin, "Method of Cutting; Its Effect on Reproduction in the White Pine Type." Un-



over story in the expectation that not only the clear cut published material is available for several articles suitable for the Journal of Forestry, Ecology, and Journal of Agricultural Research.

This experiment is also directed toward minimizing ribes. White pine methods of cutting at Deception Creek Branch.  
development.

An entirely new approach was made to the problem of reducing shade and root competition of trees of inferior species left after cutting. Using C.C.C. labor, all hemlock, white fir, and cedar was removed from a mature stand prior to cutting the merchantable white pine. The intention is to determine whether in the remaining rather open stand a full stocking of white pine seedlings will be established immediately. The experiment is directed toward minimizing the development of ribes by shortening the interval of open conditions between cutting and the closing of the canopy of a new forest. If successful, this method will be varied and repeated hoping that the lowered cost of ribes control will more than offset the additional cost of the silvicultural treatment.

Three new "methods of cutting" plots were established in connection with the sale of 1½ million feet of white pine lumber. In this sale we went back to the system of clear cutting in strips which on similar sites resulted in success in several early Forest Service timber sales. A difference is that we are also treating the reserved strip by removing the hemlock under and that some areas are better adapted to growing hemlock



over story in the expectation that not only the clear cut strips but the reserve strip as well will reproduce and thus permit of removal of the reserve in a very few years. This experiment is also directed toward minimizing ribes development.

south slope sites?

### Region's Questions

#### 4. Mixed Species (Western White Pine Type)

##### 1. Seed Trees.

What is the relation of white pine reproduction on cutover areas to seed trees? Do we need to leave seed trees? Is there definite proof that there is better reproduction where seed trees have been left than where all pine is cut? Are two seed trees over 20 inches worth more in actual results than ten trees 14 inches and under? What class of seed trees is most free from windfall? Is the average loss in seed trees too great to justify leaving them?

##### 2. White Pine Reproduction.

When defective and suppressed hemlock or white fir forms a high percent of the stand and we dispose of it at great cost by felling and piling and burning the brush, how sure are we that we will be rewarded by good pine reproduction? Why do we have some areas, such as Hayden Creek, where we have secured no reproduction for several years after cleaning out the hemlock? Is it possible that some areas are better adapted to growing hemlock



It is believed that all the Region's questions are included in the outline of Station projects. If the money trying to make them grow a high percent of white pine? Station's introductory statement, that the "studies have answered many of the pressing questions relative to white

### 3. South Slopes.

How should we out to obtain reproduction on severe south slope sites? There is a considerable gap to be bridged between known facts and their application. That this is the case is well

### 4. Mixed Species.

What will be the result of cutting straight white pine in stands containing only 40 percent to 50 percent pine? Will we get white pine reproduction, and if so will it stay alive and recover if we are able to cut the mixed species in 20 or 30 years? What is the maximum amount of mixed species we can leave without practically eliminating white pine? What ought we to do with such stands if mixed species continue unsealable?

Is selection cutting in the white pine type a feasible silvicultural method under any circumstances? Will not any form of management except approximate clear cutting eventually eliminate white pine?

What treatment should private owners apply in the way of silvicultural measures or slash disposal to over-mature defective stands?

Is the Forest Service treatment of such stands by slashing, broadcast burning, and planting financially sound?

available moisture (no proof available), perhaps due to



It is believed that all the Region's questions are included in the outline of Station projects. If the Station's introductory statement, that the "studies have answered many of the pressing questions relative to white pine establishment and survival," is true, then there must be a considerable gap to be bridged between known facts and their application. That this is the case is well illustrated by examining one of the Region's questions.

"3. South slopes - how should we act to obtain reproduction on severe south slope sites?" The answer might appear to be contained in Haig's findings. By well disturbing the duff during logging and slash disposal provide good seed-bed material. By leaving well distributed seed trees provide shade enough over a large percentage of the area to keep maximum surface temperatures below 125° F. But at the same time remove enough trees (root competition for water) to leave soil moisture sufficient for survival of newly germinated trees. Between these last two sentences lies a big "nigger in the woodpile." It is probably not difficult (not known however) to show that when on many severe south slope sites shade is sufficient, water-use by the shading trees and by evaporation reduced soil moisture at seedling root-depths below the wilting coefficient. All the thinly scattered seed-tree stand left on several such sites have died perhaps due to evaporation of previously available moisture (no proof available), perhaps due to leaving very rough and lumpy trees, with little growth possibilities?



topsoil changes (no evidence available). Under these conditions would plantations of nursery stock live, if the mature stand were clearcut and the slash broadcast burned to remove all root competition, at the same time raising maximum surface temperature over the entire area above 125° F.?

The silviculture of the Engelmann spruce type in this region is entirely unsolved. Most of the attempts have given negative results. Should we cut selectively; clean Ponderosa pine methods of cutting.

Other than the installation of 20 reproduction quadrats in the three permanent plots near Greenough, Montana, in 1934, and their current examination, no further work on this project was done last year and little other work is contemplated for 1936.

The Region's questions are concerned primarily with methods of removing mature stands. Whatever the various solutions may be is in Region's Questions

Ponderosa pine type the Station's projects do not include studies what can we do with stands such as we frequently get on the Kootenai with five to seven big ponderosa pine per acre and a full understory of Douglas fir, white fir, cedar, and lodgepole pine? In the experimental forests what can we do with such stands as the old Seeley Lake sale where on large areas there is practically no reproduction 30 years after cutting, although the supply of seed trees seems ample? To what extent should we adopt economic selection, leaving very rough and limby trees, or 14 to 16-inch trees with little growth possibilities?



Two factors whose influences in large-scale cutting  
Cedar type

operations are almost unknown are soil moisture and soil  
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large, old trees? I have never yet seen such a flat success-  
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Spruce type

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region is entirely unsolved. Most of the attempts have

given negative results. Should we cut selectively; clean

out; leave seed groups, seed strips or seed blocks; vary-

broadcast burn or pile and burn the slash? If we ever

get a big spruce sale we will be still experimenting, to

without a definite answer. High-value species that will com-

stitute The Region's questions are concerned primarily with

methods of removing mature stands. Whatever the various

solutions may be it is evident they are not known now. It

is also evident that the Station's projects do not include

studies in all the types for which the Region desires very

information soon. An evident problem is to give application

service and to give it as rapidly as usable facts and

indications become known. In the experimental forests

demonstrations will provide good evidence, much of it re-

quiring many years. In the meantime, more empirical

evidence must be applied to large scale silvicultural

operations. The station has considerable indicative basic

data and the best that is available to guide empirical

conclusions. Development according to amount of overwood, endeavoring to fill all

growing space with trees to exclude ribes plants. Development



Two factors whose influences in large-scale cutting operations are almost unknown are soil moisture and soil itself. A continuation as soon as possible of soil investigations seems justifiable considering that much of competition, survival, and yield are determined in the root zone. Haig's excellent work was a noteworthy beginning.

### Development of Stands

#### Reproduction stands; western white pine type

Development of seedlings is being studied under varying amounts of overwood, in natural stands and when weeded in different ways. In weeding, the primary purpose is to increase the percentage of high-value species that will constitute the future crop. This procedure is an alternative of wasting growing space carrying low-value species to maturity then destroying them to make room for another new stand.

Alterations in composition of the plots treated vary within the limits of the two following examples.

Acres treated	Age Years	Percentage of trees present			
		Before treatment		After treatment	
		White pine	Other	White pine	Other
45	16	15	85	80	20
5	8	10	90	65	35

Another purpose of the studies is to determine development according to amount of overwood, endeavoring to fill all growing space with trees to exclude ribes plants. Development



in natural stands is being determined in the check-plots installed for comparisons with plots given different treatments. Permanent plots established total 21, semi-permanent 17.

Results to date indicate that before weeding stands must be old enough to have dominance evident, i.e., 10-20 years old. This is the best stand age at which to accomplish a uniform spacing of future crop trees. Cost of weeding in older stands increases rapidly with age. Manuscript of a manual on stand improvement work is being prepared in co-operation with the Region. After field use this season in mimeographed form it will be revised and offered for publication.

Stands pole-size to mature; western white pine type

Stands larger than sapling size are usually too old to have their species composition greatly altered without considerable loss in growth. Natural changes in distribution of basal area to species and changes brought about by thinnings intended to favor white pine without damaging growth rate of the stand are shown in the following tabulation.

Percentage gain and loss by species in basal area of dominant and co-dominant trees per 10-year period in eight thinned plots and in twelve scattered unthinned plots.



Western:	white	pine	larch	fir	Lowland:	white	fir	hemlock:	Misc.
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Thinned plots 1/

-1.0	: -0.7	: -0.2	:	:	:	-0.1
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Unthinned plots 2/

-2.7	: -0.4	: -0.4	:	-2.5	: -0.3	: -0.1
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1/ Stand 50 years old in 1914 when first plots established.

2/ Stands 30-75 years old when plots established.

Thinnings of varying intensity and according to different methods are being made. With no market for thinnings their disposal and fire control costs are important. It is probable that mid-summer moisture is a limiting growth factor on most sites. Specifically, is available water most efficiently used under increased evaporation with wind admitted by thinning from below, or when the non-crop understorey trees that shut out wind use water when left in thinning from above? Integrating water use, disposal of thinned material and fire control cost, what method of thinning costs least per cubic foot of growth in future crop trees?

In these studies 37 permanent plots measured every five years have been established since 1914, one a 16 sub-plot latin square. Three new blocks are contemplated in 1936 to complete a series started.



Publication in 1937 of Davis' partly completed manuscript on statistical analysis of height-diameter curves in 84 plots measured by Mr. Sabre some 10 years ago, the data from 370 representative plots were sent to Mr. Meyer. Latin square sub-plots is planned.

Results are not yet available.

Stands pole-size to mature: ponderosa pine type

It is planned to make semi-permanent 110 of the above temporary plots. In thinnings the same factors as enumerated under western white pine are being studied. Permanent plots used are six established in 1918 and 1921 and twelve in 1933-1935, mostly in a 30-year-old stand.

Following Growth and Yield 1932 and 1934 in 86 Western white pine

In this study 34 permanent and 36 semi-permanent plots have been established, mostly between 1922 and 1926. Re-measurements are made at 5 and 10-year intervals. Two plots are devoted to growth in overmature stands and one to growth in almost pure cedar. One pair of plots is intended to show the effect of pruning. The remainder of plots are in immature stands. Due to the very high value of cedar in the form of

poles Following the publication by Haig in 1932 of a bulletin on normal yield an urgent problem is application of normal yield tables to natural stands containing species mixed in varying percentages and covering sites to varying degrees of completeness. in relation to total yield on any

Ponderosa pine

For the inter-regional yield table project measurements were made in 155 temporary plots (38 of them prior to 1934) within this region and 31 in the Black Hills. Including



is planned to inventory all growth on selected plots. the 84 plots measured by Mr. Behre some 10 years ago, the data from 270 representative plots were sent to Mr. Meyer. Results are not yet available.

It is planned to make semi-permanent 110 of the above temporary plots.

#### Larch-fir

This project was initiated in 1932 in cooperation with the Region to determine growth of residual stands of larch-fir. Following measurements in 1932 and 1934 in 86 temporary plots logged 25-35 years before, the data were partially summarized. Publication is contemplated during the winter of 1936-1937.

For use of the "Survey" (growth phase) that agency measured 150 plots from which 42 were selected to be semi-permanent.

#### Western red cedar

Due to the very high value of cedar in the form of poles and almost complete lack of information on its silvicultural possibilities, a beginning of studies this year is contemplated. Because this species always occurs in mixture and usually as an understory tree, it is necessary to study its yield in relation to total yield on any area.

Data of limited extent are available from five-year measurements since 1914 in 15 western white pine thinning plots. In cooperation with the "Survey" (growth phase) it



is planned to inventory all growth on selected plots.  
area is important because it probably embraces the best

### Forestation studies

As a result of the expanded planting program of Region One, and unsatisfactory survival in plantations, the Station was bulldozed around 75 acres. On eight acres, half outside after a lapse since 1926 reinstated forestation research in side the fire line, parallel strips were bulldozed free July.

of brush, the strips being eight feet wide and about twelve feet between their edges. After burning all brush inside was made covering about 60,000 acres of administrative the line a row of trees will be planted in each strip and planting during the last 25 years. The results indicate check planting will be done in adjacent untreated brush. an average survival five years after planting of 38 percent At Priest River Branch a similarly treated six-acre project for the major species and classes of stock planted, with 41 percent for ponderosa pine and 48 percent for western white pine in unmixed plantations. These figures represent directly seeding the rodent-free interiors of larger burns as a more inexpensive way of reforestation, a preliminary per acre. Immediate studies of methods of planting species set of eleven small plots were seed-spotted and broadcast and class of planting stock are planned with work as soon sowed on north and south slopes on the Selway burn of 1934. as possible in soils and soil water.

Additional installations are planned for the spring and fall of 1935. In older plantations volunteer wolf trees of lodge-pole pine and larch were found twice as tall as planted Cooperating in a nation-wide seed manual information trees and their disastrous suppression effects were evident. on seed collection and treatments has been assembled for The need of a systematic study of stocking and competition five native coniferous species. During field season notes of brush and volunteer trees in plantations over 10 years were taken on ripening dates and character of fruit crops old is indicated.

of shrubs useful for erosion control, and for game food and cover. Region One has a brushfield planting problem on parts of 200,000 acres of private land cutover and burned 20 years ago and recently donated to the Forest Service. The



area is important because it probably embraces the best timber-growing land in the region, the fertile loess soil of the St. Joe-Palouse country. Last fall a fire line was bulldozed around 75 acres. On eight acres, half outside the fire line, parallel strips were bulldozed free of brush, the strips being eight feet wide and about twelve feet between their edges. After burning all brush inside the line a row of trees will be planted in each strip and check planting will be done in adjacent untreated brush. At Priest River Branch a similarly treated six-acre project was started.

To investigate the possibilities and methods of directly seeding the rodent-free interiors of larger burns as a more inexpensive way of reforestation, a preliminary set of eleven small plots were seed-spotted and broadcast sowed on north and south slopes on the Selway burn of 1934. Additional installations are planned for the spring and fall of 1936.

Cooperating in a nation-wide seed manual information on seed collection and treatments has been assembled for five native coniferous species. During field season notes were taken on ripening dates and character of fruit crops of shrubs useful for erosion control, and for game food and cover.

Another botanical study is the arboretum started in 1932, which now has 40 species of native and exotic conifers



Botanical studies

One of the Station's longtime projects now beginning to yield results is that including 22 planted plots started in 1911 to test the behavior and adaptability in northern Idaho of geographic races of ponderosa pine from a wide range throughout the western United States. At 20-year age striking differences in survival and in height, diameter, and foliage are described in a manuscript 90 percent completed.

When the home localities were grouped into similar climatic conditions, the average stem dimensions shown in the following table were found.

<u>Climatic Grouping</u>	<u>Height Ave. Ft.</u>	<u>Diameter Ave. D.B.H. Inches</u>
Northern Rocky Mountains	13.1	2.4
Sierra-Siskiyou Mountains	10.9	2.4
Columbia Plateau	10.9	2.1
Black Hills	10.5	1.7
Colorado	8.8	1.6
Arizona-New Mexico	8.2	1.5
Utah	7.2	1.2

The relation of height to diameter was found to agree with that existing in home localities.

The fact that the poorest general survival was shown by strains from the Santa Fe, Kaibab, Siskiyou, and Shasta, and the best from local strains demonstrates the desirability of planting trees grown from local seed.

Another botanical study is the arboretum started in 1932, which now has 40 species of native and exotic conifers



planted in blocks of 1/4 to one acre in size, to which fifteen blocks were added in 1935. This year's acquisition included 100 cuttings each of ten strains of poplar which are to be tried as pulp producing trees in cooperation with the Oxford Paper Company and the New York Botanical Garden.

John C. Hartt  
 L. C. Harby  
 R. H. Weidman  
 L. V. Anderson  
 G. M. DeLarrette  
 Lincoln Allison  
 E. F. Reppeger  
 G. H. Whitney  
 L. J. Cummings  
 Kenneth P. Davis  
 J. B. Thompson  
 H. J. Woolfolk  
 G. M. Jamison  
 M. J. Pershine  
 M. E. Bouchard  
 Wagner Duncan

Senior Forester  
 Senior Range Examiner  
 Senior Silviculturist  
 Senior Silviculturist  
 Senior Silviculturist  
 Forester  
 Associate Forester  
 Associate Range Examiner  
 Associate Forester  
 Associate Forester  
 Assistant Forester  
 Assistant Forester  
 Assistant Superintendent  
 Assistant Superintendent  
 Junior Forester  
 Senior Clerk  
 Clerk-Stenographer  
 Senior Stenographer

Emergency Work  
 (E. C. E.)

<u>Name</u>	<u>Title</u>	<u>Status</u>
T. E. Rowland	Associate Forester	Appointed
Eric A. Anderson	Junior Forester	Appointed
Stewart E. Brown	Junior Forester	Appointed
William W. Ensign	Junior Forester	Appointed
Edward Dobrian	Junior Range Examiner	Unappointed
Harman O. Flake	Junior Forester	Appointed
Alfred A. Flint	Junior Forester	Appointed
Joel Frykman	Junior Forester	Appointed
William F. Gantemann	Junior Forester	Appointed
G. Lloyd Hayes	Junior Forester	Appointed
Jess M. Honeywell	Junior Forester	Unappointed
H. Blair Hutchison	Junior Forester	Appointed
Gerland L. James	Junior Forester	Appointed
Theodore Kachin	Junior Forester	Appointed
Elmer R. Marks	Junior Forester	Appointed
Charles A. Wellner	Junior Forester	Appointed
H. J. Smith	Principal Forest Ranger	Appointed
Frank B. Casler	Forest Ranger	Appointed



<u>Name</u>	<u>PUBLICATIONS</u>	<u>Title</u>	<u>Status</u>
Howard B. Hawk		Assistant to Technician	Unappointed
Orlo B. Johnson		Assistant to Technician	Unappointed
Eric Rutquist		Assistant to Technician	Unappointed
Carl B. Ostrom		Assistant to Technician	Unappointed
G. W. Branning		Junior Draftsman	Unappointed
E. V. Wagner		Junior Draftsman	Unappointed
H. H. Larsen		Clerk	Appointed
H. A. Pissot		Jr. Clerk-Stenographer	Appointed
Claire Derrick		Clerk	Appointed
Grayce Tubbs		Clerk	Unappointed

3. Comparative germination of tree species on various
- 15 C.C.O. enrollees (Missoula Headquarters)
- 12 H.R.A. Relief Rollers (Missoula Headquarters)
- 10 H.Y.A. University Students (Missoula Headquarters)
4. The character of the 1935 fire season in Region One.  
Gisborne, H. F. Applied Forestry Note No. 75, November, 1935.
5. Don't let a "normal" deceive you. Hayes, G. Lloyd.  
Service Bulletin, August 19, 1935, vol. 29, No. 17, p. 4.
6. Overgrazing increases production costs. Hurtt, Leon G. The American Hereford Journal, September 1, 1935, pp. 3-4. The Cattleman, September, 1935, vol. 22, no. 4, pp. 21-22.
7. Regrassing Montana's prairies. Hurtt, Leon G. The Montana Farmer, September 1, 1935, p. 18.
8. Cattle production costs are increased by overgrazing. Hurtt, Leon G. Applied Forestry Note No. 71, July, 1935.
9. Influence of weather factors on moisture content of light fuels in forests of the northern rocky mountains. Jamison, George M. Journal of Agricultural Research, vol. 51, No. 10, November 15, 1935, pp. 885-908.
10. Range cattle in eastern Montana consumed abnormal amounts of salt during the 1934 drought. Kennedy, Fred H. The American Hereford Journal, December 15, 1935.



## PUBLICATIONS

### PUBLISHED SINCE LAST REPORT

1. Match plank and commercial lumber from western white pine logs. R. Anderson, L. V. Applied Forestry Note No. 72, July, 1935. ~~unpublished~~.
2. Progress report on the Forest Resource Survey. DeJarnette, G. M. Applied Forestry Note No. 70, July, 1935. as bulletin by School of Forestry, Yale University, April, 1935.
3. Comparative germination of tree species on various kinds of surface soil material in western white pine type. Fisher, George M. Ecology, vol. XVI, No. 4, October, 1935, pp. 606-611. as Master's thesis, under a Park Fellowship.
4. The character of the 1935 fire season in Region One. Cisborne, H. T. Applied Forestry Note No. 73, November, 1935. Northwest Forester, R. E. U.S.D.A. technical bulletin, June, 1936. (In galley proof.)
5. Don't let a "normal" deceive you. Hayes, G. Lloyd. Service Bulletin, August 19, 1935, vol. 29, No. 17, p. 4.
6. Overgrazing increases production costs. Hurtt, Leon C. The American Hereford Journal, September 1, 1935, pp. 3-4. The Cattleman, September, 1935, vol. 22, no. 4, pp. 21-22.
7. Regrassing Montana's prairies. Hurtt, Leon C. The Montana Farmer, September 1, 1935. p. 18.
8. Cattle production costs are increased by overgrazing. Hurtt, Leon C. Applied Forestry Note No. 71, July, 1935.
9. Influence of weather factors on moisture content of light fuels in forests of the northern rocky mountains. Jemison, George M. Journal of Agricultural Research, vol. 51, No. 10, November 15, 1935, pp. 885-906.
10. Range cattle in eastern Montana consumed abnormal amounts of salt during the 1934 drought. Kennedy, Fred H. The American Hereford Journal, December 15, 1935.



SUBMITTED FOR PUBLICATION

1. Production costs and selling values of railroad
1. Measuring fire weather and forest inflammability. Cisborne, H. T. To Government Printing Office as bulletin or miscellaneous publication.
2. Factors controlling initial establishment in western white pine. Haig, I. F. Accepted for publication as bulletin by School of Forestry, Yale University, April, 1935.
3. The effect of low vegetation on the rate of spread of fire in the northern rocky mountain region. Jamison, George M. To Yale University as Master's thesis, under a Pack Fellowship.
4. Timber growing and logging practice in the ponderosa pine type of the Northwest. Weidman, R. H. U.S.D.A technical bulletin, June, 1934. (In galley proof.)
5. Growth and yield data from permanent sample plots in western white pine stands. Davis, R. P. Journal of Agricultural Research.
6. Volume increment on cutover areas in the western white pine type. Davis, R. P. and Seiliner, C. A. Journal of Agricultural Research.
7. Testing the reliability of height-diameter. Davis, R. P. Journal of Forestry.
8. Some effects of the 1934 drought on vegetation near Miles City, Montana. Ellison, L., and Woolfolk, H. J. Ecology.
9. Abundance of inferior logs left on ground after high grading experimental ponderosa pine area. Results in heavy damage to residual stand. Evenden, J. G. Applied Forestry Note.
10. Forest statistics release for Benewah County, Idaho. (From Forest Survey.) Forest Survey staff.
11. Forest statistics release for Spokane County, Washington. (From Forest Survey.) Forest Survey staff.
12. Forest statistics release for Kootenai County, Idaho. (From Forest Survey.) Forest Survey staff.



13. IN PREPARATION OR PROPOSED FOR F. Y. 1937 County, Washington. (From Forest Survey.) Forest Survey staff.
1. Production costs and selling values of railroad ties produced from the larch-Douglas fir stands of Western Montana. Anderson, I. V. Forest Survey Technical bulletin, University of Montana.
2. Production costs, selling values, and utilization facts in the manufacture of matches from western white pine. Anderson, I. V., Rapraeger, E. F., and Hubert, M. R. Technical bulletin, University of Idaho. (From Forest Survey.) Forest Survey staff.
3. Log and tree grades for ponderosa pine of the Inland Empire. Anderson, I. V. and Keff, F. Technical bulletin, University of Montana.
4. Manual on stand improvement methods for northern rocky mountain region. Davis, K. P. and Region One. U.S.D.A. Miscellaneous publication. (From Forest Survey.) Forest Survey staff.
5. Growth and yield data from permanent sample plots in western white pine stands. Davis, K. P. Journal of Agricultural Research.
6. Volume increment on cutover areas in the western white pine type. Davis, K. P. and Weliner, O. A. Journal of Agricultural Research.
7. Testing the reliability of height-over-diameter. Davis, K. P. Journal of Forestry.
8. Some effects of the 1934 drought on vegetation near Miles City, Montana. Ellison, L., and Woolfolk, E. J. Ecology.
9. Abundance of inferior logs left on ground after high grading experimental ponderosa pine area. Results in heavy damage to residual stand. Evenden, J. C. Applied Forestry Note.
10. Forest statistics release for Benewah County, Idaho. (From Forest Survey.) Forest Survey staff.
11. Forest statistics release for Spokane County, Washington. (From Forest Survey.) Forest Survey staff.
12. Forest statistics release for Kootenai County, Idaho. (From Forest Survey.) Forest Survey staff.



13. Forest statistics release for Pend Oreille County, Washington. (From Forest Survey.) Forest Survey staff.
14. Forest statistics release for Stevens County, Washington. (From Forest Survey.) Forest Survey staff.
15. Forest statistics release for Shoshone County, Idaho. (From Forest Survey.) Forest Survey staff.
16. Forest statistics release for Bonner County, Idaho. (From Forest Survey.) Forest Survey staff.
17. Forest statistics release for Boundary County, Idaho. (From Forest Survey.) Forest Survey staff.
18. Forest statistics release for Latah County, Idaho. (From Forest Survey.) Forest Survey staff.
19. Forest statistics release for Lewis County, Idaho. (From Forest Survey.) Forest Survey staff.
20. Forest statistics release for Nezperce County, Idaho. (From Forest Survey.) Forest Survey staff.
21. Forest statistics release for Clearwater County, Idaho. (From Forest Survey.) Forest Survey staff.
22. The character of the 1936 fire season in Region One. Gisborne, H. T. Applied Forestry Note.
23. A ten-year record of lightning storms and forest fires. Gisborne, H. T. Monthly Weather Review.
24. Principles of measuring forest fire danger. Gisborne, H. T. Journal of Forestry.
25. Reproduction on outover areas in the western white pine type. Haig, I. T. and Wellner, C. A. U.S.D.A. Bulletin.
26. Natural reproduction of western white pine. Authors of partial manuscript written, Haig, I. T. and Weidman, R. H. U.S.D.A. Bulletin.
27. Fire danger factors by altitude and exposure. Hayes, G. L. Applied Forestry Note.
28. Survival in forest plantations of the northern rocky mountain region. Hornby, L. G. Journal of Forestry.



29. Fire control planning in the Northern Rocky Mountains. Hornby, L. G., 500 pages, mimeographed.
30. Outline of fire control planning methods. Hornby, L. G. Journal of Forestry.
31. Residual growth on larch-fir cutover areas in western Montana. Hornby, L. G. and Weidman, R.H. Journal of Forestry.
32. Regrassing dry-farmed lands in Montana at low costs. Hurtt, Leon C. Livestock Journal.
33. Management shortgrass ranges of the Northern Great Plains progress report. Hurtt, Leon C. Livestock Journal.
34. Fence posts for Montana farms. Hutchison, S. B. Applied Forestry Note.
35. Fuelwood consumption in the Inland Empire. Hutchison, S. B. Journal of Forestry.
36. Effect of vegetative condition on rate of spread of fire. Jamison, George M. Journal of Forestry.
37. Felling and bucking costs in western white pine. Rapraeger, E. F. Trade Journal article.
38. What percentage of volume of a western white pine tree is contained in the butt log? Rapraeger, E. F. Applied Forestry Note.
39. Value depreciation from fire in western white pine. Rapraeger, E. F. Applied Forestry Note.
40. Some effects of climate upon forests. Weidman, R. H. Scientific Monthly.
41. Differences in progeny of ponderosa pine from various seed sources. Weidman, R. H. Journal of Agricultural Research.
42. Treatment of farm fence posts. Whitney, C. N. Montana Farmer.
43. Durability of cross ties in Montana test tracks. Whitney, C. N. Applied Forestry Note.
44. Wood requirement per ton of copper ore mined. Whitney, C. N. Applied Forestry Note.



## EXPENDITURES F.Y. 1936 (Estimated)

Lines of Work	Reg. Salary	Res. Salary	Funds	Regular	Research	Coop. Work	Emergency Funds			Regional Contrib.	Coop. Funds	Quarters Deduction	Admin. Savings	Vacancy Savings
							Nira	EDW	ERA					
<b>Forest Management</b>														
Management White Pine				6,523.95	22,089.82		311.15	6,166.02	8,853.24					
Thinning				1,024.25			51.73	1,025.12	1,471.84					
Management Ponderosa Pine				89.70			4.23	84.79	121.73					
Thinning				171.24			8.16	161.86	232.40					
Management White Pine				1,900.02			90.62	1,795.85	2,578.51					
" Ponderosa Pine				106.00			5.05	100.19	143.89					
Regeneration - Botany				89.70			4.23	84.79	121.73					
" - Forestation				4,860.14			231.81	4,598.69	6,595.66					
Protection - Attack				3,056.95			150.00	2,046.23	3,616.36					
" - Behavior				9,653.65			443.58	6,461.85	11,420.07					
Special Studies				814.52				645.25	963.57					
<b>TOTAL</b>				<b>28,350.00</b>	<b>2,089.82</b>		<b>1,300.66</b>	<b>23,065.63</b>	<b>36,119.00</b>					
<b>Range Investigations</b>														
Management - Shortgrass ranges				15,083.20			140.00	11,720.34	7,971.20					
" - Summer ranges				3,917.70			30.00	3,044.23	1,966.55					
Artificial Recessing				2,899.10			25.16	2,252.76	1,455.25					
Special Range Report				2,500.00				500.00						
<b>TOTAL</b>				<b>24,400.00</b>			<b>195.16</b>	<b>17,517.33</b>	<b>10,993.00</b>					
<b>Forest Economics</b>														
Forest Survey - Idaho				15,556.05			1,096.07	32,407.14	3,256.67					
" - Montana				3,423.94			1,400.00	7,132.94	716.80					
" - Washington				1,020.01				2,124.90	213.53					
<b>TOTAL</b>				<b>20,000.00</b>			<b>2,496.07</b>	<b>41,664.98</b>	<b>4,187.00</b>					
Temporaries - Salary and Wages														
<b>TOTALS</b>														
<b>Forest Products</b>														
Logging & Milling Studies				7,646.39										
Statistics				2,539.65										
Wood Preservation				1,413.96										
Travel Expenses														
Transportation of Things														
Rents														
Equipment														
Other														
<b>TOTALS</b>														
<b>GRAND TOTALS</b>														



Distribution of Salaries and Expenses of Regular Organization by Regular Appropriation

Distribution of Salaries and Expenses of Regular Organization by Regular Appropriation																		
Position & Classification grade	Name	Base Salary Rate Per Annum	Forest Management Allotment		Range Invest'n. Allotment		Forest Products Allotment		Forest Survey Allotment		E. C. W.	Soil Eros. Invest. Allotment		Regional Contrib.	Coop. Funds	Quarters Deduction	Adm. Furloughs	Vacancy Savings
			Empl't Period Month	Base Salary	Empl't Period Month	Base Salary	Empl't Period Month	Base Salary	Empl't Period Month	Base Salary								
P-7 Director		6800			2	1085			9	4875								542 (75)
HAF-7 Jr. Asst. Parekh, M. J.		2600	12	2600														
HAF-4 Clerk Larson, H. H.		1920			12	1920												
HAF-3 Sr. Stone Duncan, Dagmar		1680			12	1680												
HAF-3 Asst. Clerk Bouchard, Marie		1680			4	540	8	1080 1/2										
P-5 Sr. Silv. Glaborn, H. T.		4600	12	4600														
P-5 Sr. Silv. Hornby, L. G.		4600	12	4600														
P-5 Sr. Silv. Weidman, R. H.		3800	12	3800														
P-3 Assoc. Silv. Davis, F. P.		3200	12	3200												180 (75)		
P-3 Assoc. Silv. Jamieson, G. M.		2600	12	2600													1820 (75)	
HAF-7 Asst. Supr. Thompson, J. R.		2300	2 1/2	480														
P-1 Conservationist Wellner, C. A.		4800			12	4800												
P-5 Sr. Pge. Exp. Rurt, L. C.		3800			12	3800										180 (21)		
P-3 Assoc. " Williams, Lincoln		2600			12	2600											167 (21)	
HAF-7 Asst. Supr. Woolfolk, E. J.		2000			11	1633												
P-1 Jr. Exp. Exp. Vacant		1440			12	1440												
HAF-2 Jr. Stone Plesot, Henrietta		4600			12	4600												
P-5 Sr. Forester Anderson, I. V.		3800			12	3800								700				
P-3 Assoc. " Rupprecht, E. F.		3800			7	1167			6	1333								
P-3 Assoc. " Whitney, C. H.		3800							12	5600 2/3								
P-5 Sr. Forester Bradner, M.		5600							12	3800								
P-3 Assoc. " DeJarnette, G. M.		3800							3	800								
P-3 Timber Exp. Pratt, F. H.		3800							12	2600								
P-2 Asst. Forester Cummings, L. J.		2600																
Temporaries - Salary and Wages																		
Totals			86 1/2	28080	101	20656	41 1/2	10367	53	18508				700		240	1820	709
Miscellaneous Expenses																		
Forest Mgmt.			Range Invest.			Forest Products			Forest Survey			For. Fire Coop'n.			Soil Eros. Invest.			
02 Supplies and Materials			2/ (600)			1075			280			80			300			
05 Communication Service			2/ 100			100												
06 Travel Expenses			1195			2/ (750)			2700			663			2/ (250) 1192			
07 Transportation of Things (Service)			2/ 100			87												
11 Rents						2/ 867												
20 Equipment									800									
15 All Other																		
2/ Overhead																		
Totals			2470			2744			1213			1492						
GRAND TOTALS			28580			24400			11400			20000						



Form No. 5.

**ESTIMATED DISTRIBUTION OF  
DIRECT AND OVERHEAD EXPENDITURES  
Northern Rocky Mountain Forest & Range Experiment Station  
Fiscal Year 1937**

	Forest Management		Range	Forest	Forest	Total
	Silvic.	Fire	Inves.	Products	Survey	
Regular Research	14,725	13,625	24,400	11,600	20,000	84,350
Percent of total	17.46	16.15	28.93	13.75	23.71	100.00
Proportionate share of overhead	2,718	2,514	4,503	2,140	3,690	15,565
Actual distribution of overhead	none	3,400	6,500	none	5,665	15,565
E.C.W.	7,000	6,500	2,000	none	29,000	44,500
Percent of total	15.73	14.61	4.49	none	65.17	100.00
Proportionate share of overhead	625	581	173		2,591	3,975
Actual distribution of overhead	840	1,000	none		2,135	3,975
Total allotment	21,725	20,125	26,400	11,600	49,000	128,850
Percent of total	16.86	15.62	20.49	9.00	38.03	100.00
Proportionate share of overhead	3,294	3,052	4,004	1,759	7,431	19,540
Actual distribution of overhead	840	4,400	6,500	none	7,800	19,540



## SUPPLEMENTAL REPORT

This supplement to the Annual Investigative Program report covers the points raised in Marsh's R-Investigative Program letter of February 15, 1936. An earnest endeavor has been made by staff members of this Station to give as realistic a picture as possible of outstanding accomplishments and work done during the past year. The outstanding results obtained during the past year are given in the main body of this report under the "Progress and Plan" writeups for each divisional field of work. No additional statements, covering points raised in Section (1) of the letter, are therefore included in this supplemental report. The information called for in Sections (2) to (7), inclusive, of the letter follow in chronological order.

### 2. Plans and Estimates for Fiscal Year 1938 (Including supporting statements).

In order to formulate plans for new work for the fiscal year 1938, a thorough analysis was made of the outstanding problems in this region. Work in the divisional fields of forest economics, and forest influences, as well as expansion in the other already established lines of work, is necessary if we are to keep ahead of the requests for useable data. Meager financial support in the past and present limited allotments have made it impossible to even attack the most pressing problems. Silvicultural investigations in other



important timber types, and even within certain portions of the range of the very valuable white pine, have been impossible to date. The same is true of range management investigations where three major range conditions must be studied before a sound, well balanced range-use program for Montana can be developed. One basic phase of the fire problem has not yet been touched. This is the sound financing of fire control in relation to values protected and damages sustained. Present funds for production costs and utilization investigations at this station are insufficient to study more than one typical operation every two years. Within this region there are five commercially important timber types, comprising many different conditions and operations in which such studies are urgently needed. The early completion of the Forest Survey of the entire Northern Rocky Mountain region is urgently needed if wise land use planning is to have any practicable value.

There is given below, under each divisional field of work, separately by work projects, the expected appropriation for F.Y. 1937, the increases necessary in F.Y. 1938 to initiate the new work, and a supporting statement justifying the increases. In addition to the budget estimates for each divisional field of project work, there is given an estimate of the annual cost of maintenance on permanent improvements which should be covered by regular appropriations.



R-NRM  
Estimates  
F.Y. 1938

Supporting Statement No. 1

FOREST MANAGEMENT (Financial Project)

	F.Y. 1937 1/	F.Y. 1938	Increase or Decrease	No. of supporting statement
<u>JUSTIFICATION FOR APPROPRIATION</u>				
Ponderosa Pine Type				
Silvicultural inves.	\$ 1,200	\$ 16,200	\$+15,000	1
Mensuration "	589	589		
White Pine Type				
Silvicultural inves.	\$ 10,844	\$ 30,844	\$+20,000	2
Mensuration inves.	767	767		
Larch-fir Type				
Silvicultural inves.	\$ 15,000	\$ 15,000	\$+15,000	3
Mensuration "	589	589		
Forest Planting				
Regeneration inves.	\$ 736	\$ 15,736	\$+15,000	4
Fire Protection Inves.	\$ 13,625	\$ 33,625	\$+20,000	5

SUMMARY BY WORK PROJECTS

Silvicultural inves.	\$ 12,044	\$ 62,044	\$+50,000
Mensuration "	1,945	1,945	
Regeneration "	736	15,736	+15,000
Fire protection "	13,625	33,625	+20,000
Totals	\$ 28,350	\$113,350	\$+85,000

1/ Based on present information 3/25/36.

A continuing appropriation of \$15,000 will finance the most essential features.



JUSTIFICATION FOR APPROPRIATION INCREASE

The western white pine forest, containing about 14½ billion board feet of timber, is the most important timber type in Montana.

JUSTIFICATION FOR APPROPRIATION INCREASE

Ponderosa pine is the most important timber type in Montana in point of amount and value of the average annual cut. It is coordinate with the western white pine type in economic importance in the entire Inland Empire. The remaining 10½ billion board feet of commercial ponderosa pine, of which nearly half is in private ownership, can, if properly handled, form the major permanent buffer against unemployment in the western half of the state. The immediate adoption of sustained yield practices over the entire area is essential if this objective is to be met. No formal research designed to answer the silvicultural questions basic to such a program has been initiated.

Cutting methods best suited to insure natural regeneration of the forest after cutting, to balance the volume to be removed by the first cut with that reserved as a basis for a satisfactory and early second cut, and the extent to which thinnings and other forms of stand improvement are justified, must be worked out. A continuing appropriation of \$15,000 will finance the most essential features.

A sum of \$20,000 is the minimum additional amount required to meet this obligation in an effective manner.



JUSTIFICATION FOR APPROPRIATION INCREASE

The western white pine forest, containing about 14½ billion board feet of commercial timber and occupying about 4 million acres, forms the main basis for the lumber industry in northern Idaho and adjacent Montana and Washington. During the past 60 years white pine lumber valued at \$265,000,000 has been manufactured. The perpetuation of this industry at maximum sustained capacity is essential if the dependent population is to continue to be gainfully employed.

Western white pine is commonly associated with five other species of little present commercial value, and varying in their requirements for light, soil, and moisture. These conditions, coupled with high protection costs against fire, insects, and blister rust, create management problems which vary widely by localities. A region wide approach is therefore essential.

Financial limitations have so far restricted investigative work mainly to the northern portion, with limited work in the central portion of the range. Material expansion in the last portion and a comprehensive study in the southern portion is badly needed. The project is designed to furnish the facts upon which to base proper management and successful perpetuation of western white pine as the major species in this complex forest type.

A sum of \$20,000 is the minimum additional amount required to meet this obligation in an effective manner.



JUSTIFICATION FOR APPROPRIATION INCREASE

The larch-fir type of the Inland Empire, containing and approximately 40 billion feet of commercial timber, forms a dense all-aged forest. The value of its wood for poles, railroad ties, mine timbers, and structural materials naturally leads to excessive cutting of small sized trees. In the absence of factual data on the effect of various methods of cutting on growth rate and perpetuation of the forest type, privately owned forests (approximately one-third of the total volume) are being seriously deteriorated and there is no assurance that public forests are being properly managed. The importance of this forest type as a source of employment demands comprehensive

A continuing appropriation of \$15,000 per year will finance a study of the most urgent problems such as (1) relationship of source of seed to survival and development; (2) investigation of nursery technique to determine the most economical silvicultural treatment of this timber type. A satisfactory method of producing satisfactory planting stock; (3) study of experimental forest for such a study has already been selected and dedicated to research. A continuing appropriation of \$15,000 will finance a program designed to furnish the most urgently needed information for sustained yield management.



Appropriation Estimates

F.Y. 1938

Forest Management

Forest Planting

Supporting Statement No. 5

JUSTIFICATION FOR APPROPRIATION INCREASE

In the national forests of the northern Rocky Mountain region more than a million acres of commercial timber land and an even greater area of high mountain watershed protection lands have been devastated by forest fire and must be planted if it is to perform its major purposes of timber production, streamflow regulation, and erosion control. To meet this situation the planting program for the region is being stepped up from 5,000 to 20,000 acres per year with the expectation of still larger increases later on. That many nursery and field planting problems must be solved if the program is to be successful is shown by the fact that only 41,000 of the 75,000 acres planted to date are classified as satisfactorily reforested.

A continuing appropriation of \$15,000 per year will finance a study of the most urgent problems such as (1) relationship of source of seed to survival and development; (2) investigation of nursery technique to determine the most economical methods of producing satisfactory planting stock; (3) study of survival of field plantations to ascertain the causes of mortality and how they can be overcome; and (4) intensive study of new methods of reforestation including field planting in pots and direct field seeding to determine the most economical method based on the actual field survival.



R-NHM

Appropriation Estimates

F.Y. 1938

Forest Management

Fire Investigations

destruction of forest fires.

Supporting Statement No. 5

recreational, commercial timber, water

building values actually destroyed and

JUSTIFICATION FOR APPROPRIATION INCREASE

Forest fire records for western Montana and northern Idaho show a marked increase in the frequency of "bad" fire seasons during the past ten years. The records show "bad years" as follows: 1899, 1910, 1919, 1926, 1929, 1931, and 1934. This increase is undoubtedly due to the same climatic changes which, farther east, are rendering parts of several states unfit for cultivation. On the national forests alone, during the past ten years, an average of more than 134,468 acres have been burned over annually, with an average annual expense of \$713,365 for fire suppression.

Considerable progress has been made by the Northern Rocky Mountain Forest and Range Experiment Station in developing methods of measuring fire danger, in studies of lightning, the mapping of fuel types, better fire detection, and faster speed of attack. New methods of control are beginning to be put into practice, but before satisfactory results can be expected this research work must be expanded and prosecuted more vigorously. One basic phase of the problem has not yet been touched, however. This is the sound financing of fire control in relation to values protected and damages sustained. It is essential that a scientific and thorough investigation



be made of the scenic, recreational, commercial timber, water control, and soil building values actually destroyed and destructible by forest fires.

An increase of \$20,000 is the minimum amount which will finance the essential expansion of existing work and initiate effective work in the new field of fire damage.

Spring-fall range				
Grazing management inv.	None	\$ 15,000	\$+15,000	4
High summer range				
Grazing management inv.	8,100	23,100	+15,000	6
Shortgrass plains				
Grazing management inv.	14,100	14,100	none	-
Artificial reseeding	8,100	22,100	+14,000	17

#### SUMMARY BY WORK PROJECTS

Grazing management inv.	\$22,270	\$ 52,270	\$+30,000
Artificial reseeding	2,100	22,100	+20,000
Totals	24,400	74,400	+50,000

1/ Based on present information 3/25/35.



## Appropriation Estimates

F.Y. 1938

## Range Investigations

R-WNM Spring-fall range, Summer range

Estimates

F.Y. 1938

JUSTIFICATION OF APPROPRIATION INCREASE

Montana supports on the average approximately 3½ million

sheep and RANGE INVESTIGATIONS (Financial Project)

largely to frequently F.Y. 1937 F.Y. 1938 Increase No. of  
1/ or Supporting  
high. Thus profits from the favorable years Decrease Statement

losses from unfavorable years. Range lands are heavily over-

Spring-fall range result the range species are  
 Grazing management inv. \$ None \$ 15,000 \$ +15,000 6

rapidly being destroyed. Stability for this important industry

High summer range  
 Grazing management inv. 8,108 23,108 +15,000 6

Shortgrass plains the present industry region none -  
 Grazing management inv. 14,182 14,182

The type of range use which will be profitable to  
 Artificial reseeding 2,130 22,130 +20,000 7

the stock owner and which will maintain sustained production

of the forage resources, the best balance between natural and

supplemental feeds, and the effect of degrees of range

SUMMARY BY WORK PROJECTS

use on the permanence of the soil to be maintained.  
 Grazing management inv. \$22,270 \$ 52,270 \$ +30,000

The range problem has three distinct phases--the shortgrass phase of the foothill  
 Artificial reseeding 2,130 22,130 +20,000

Totals 24,400 74,400 +50,000

grass lands used mainly for spring and fall pasturage, and the

high mountain summer ranges. Funds for a satisfactory attack

on the shortgrass phase at Fort Belk, Montana, have been made

1/ Based on present information 3/25/36.

available, those for research on the high summer range are en-

tirely inadequate, and no provision has been made to finance

studies in the spring-fall foothill phase. An increase of

\$30,000 will go far towards an adequate and prompt solution

of the range problems described.



R-Appropriation Estimates

Supporting Statement No. 7

F.Y. 1938 on Estimates

R-Range Investigations

R-Spring-fall range, Summer range

Artificial reseeding

JUSTIFICATION OF APPROPRIATION INCREASE

Montana supports on the average approximately 3½ million sheep and 1½ million cattle. Fluctuations in numbers, due largely to frequently recurring droughts, have been extremely high. Thus profits from the favorable years are dissipated by losses from unfavorable years. Range lands are heavily overstocked and as a result the more valuable forage species are rapidly being destroyed. Stability for this important industry is essential not only to the future development but also to the maintenance of the present industry of the region.

The type of range use which will be most profitable to the stock owner and which will maintain sustained production cannot bear the burden of such areas of wholly unproductive of the forage resources, the best balance between natural and supplemental feeds, and the effect of various degrees of range use on the permanence of the soil itself must be determined. Various types of soil and climate, and the best season, depth and methods of sowing must be worked out, and related to the phases--the shortgrass phase of the plains region, the foothill low cost at which rehabilitation of these lands must be effected. While some progress, using trial and error methods, high mountain summer ranges. Funds for a satisfactory attack has been made during the past two years using emergency funds, on the shortgrass phase at Fort Keogh, Montana, have been made nothing approaching an adequate study of the problem has been undertaken. A continuing appropriation of \$40,000 is very entirely inadequate, and no provision has been made to finance studies in the spring-fall foothill phase. An increase of \$30,000 will go far towards an adequate and prompt solution of the range problems described.



JUSTIFICATION OF APPROPRIATION INCREASE

The more than five million acres of abandoned dry farm wheat lands now supporting only annual weeds and other worthless vegetation, together with an even greater area of denuded or badly deteriorated range land, presents a serious problem in eastern Montana. The rehabilitation of this land for use by range livestock on a profitable basis is essential to the future prosperity of the region. This situation, more than any other, is responsible for the designation of eastern Montana as a major Agricultural Problem Area. The stranded settlers are in large proportion on relief and the local government cannot bear the burden of such areas of wholly unproductive land. Artificial reseeding to suitable permanent forage grasses is necessary. The proper species of forage for the various types of soil and climate, and the best season, depth and methods of sowing must be worked out, and related to the low cost at which rehabilitation of these lands must be effected. While some progress, using trial and error methods, has been made during the past two years using emergency funds, nothing approaching an adequate study of the problem has been undertaken. A continuing appropriation of \$20,000 is very urgently needed for this study.



R-NRM  
Appropriation Estimator  
F.Y. 1938  
R-NRM  
Estimates Association  
F.Y. 1938

Supporting Statement No. 3

Supporting Statement No. 3

# JUSTIFICATION FOR APPROPRIATION INCREASE

The region FOREST INFLUENCES at (Financial Project) the

Columbia River in Idaho and Montana is becoming increasingly

unsatisfactory. Floods F.Y. 1937 F.Y. 1938 Increase No. of  
1/ or Supporting  
regions of Idaho damage highways, destroy property Decrease Statement

life. Siltation of reservoirs and clogging of stream channels.  
White Pine Association \$ None \$ 50,000 \$+50,000 8  
with debris are serious problems. Observational evidence indi-  
Plains and Foothills " 15,000 +15,000 9  
cates that burned over areas in the forested watersheds are the

major contributors to this unsatisfactory condition and that the

solution may be Totalled in \$ None \$ 65,000 \$+65,000 in the

reforestation of areas already denuded by fire. Streamflow

regulation and the prevention of siltation are problems of major

importance in the management of the Grand Coulee and Bonneville

1/ Based on present information 3/25/36. and development for naviga-

tion on the Columbia River. The expensive installation for a

study of the effect of forest cover on streamflow and erosion,

such as dams on paired minor watersheds, devices for carefully

measuring runoff and erosion, and other scientific instruments

are being installed and the management plan for such a study

is being developed, using emergency funds. A continuing appro-

priation of \$80,000 is essential to properly run the project

with technicians and scientists and to finance the expenses of

carrying on this study.



JUSTIFICATION FOR APPROPRIATION INCREASE

The regimen of the streams at the headwaters of the Columbia River in Idaho and Montana is becoming increasingly unsatisfactory. Floods in the Wallace, Kellogg, and St. Joe regions of Idaho damage highways, destroy property, and endanger life. Silting of reservoirs and clogging of stream channels with debris are serious problems. Observational evidence indicates that burned over areas in the forested watersheds are the major contributors to this unsatisfactory condition and that the solution may be found in more intensive fire control and in the reforestation of areas already denuded by fire. Streamflow regulation and the prevention of silting are problems of major importance in the management of the Grand Coulee and Bonneville water storage projects, and in the proposed development for navigation on the Columbia River. The expensive installations for a study of the effect of forest cover on streamflow and erosion, such as dams on paired minor watersheds, devices for carefully measuring runoff and erosion, and other scientific instruments are being installed and the headquarters plant for such a study is being developed, using emergency funds. A continuing appropriation of \$50,000 is essential to properly run the project with technicians and scientists and to finance the expenses of carrying on this study.



R-NRM  
Appropriation Estimates  
F.Y. 1938  
Forest Influences  
Plains and Foothills  
Estimates  
F.Y. 1943

Supporting Statement No. 9

Supporting Statement No. 10

### JUSTIFICATION FOR APPROPRIATION INCREASE

The influence of herbaceous and shrubby vegetation on streamflow and erosion is of great importance to eastern Montana.

Continued overgrazing and other misuse of wild lands in the plains and foothill regions have seriously depleted the cover and over large areas the result has been practical denudation.

Along with the plant cover has gone much of the rich top soil upon which depends the revegetation of the land to useable forage species.

The construction of the Fort Peck Reservoir, the improvement of the Missouri River for navigation, and the building of storage reservoirs for irrigation on the various tributaries necessitate that the watershed lands be so used to regulate the flow of water and to prevent the destruction through silting of these works. No research to measure the effect of

cover in this particular soil, vegetative, and climatic type has been undertaken. Such studies can be most economically combined with range investigations now under way at Fort Keogh and elsewhere in Region One of the Forest Service. A continuing appropriation of \$15,000 is essential for the technical and scientific staff to conduct the work, and for the other expenses of carrying the research phase of the problem.



R-NRM  
 R-NRM  
 Estimates  
 F.Y. 1938

### FOREST PRODUCTS (Financial Project)

	F.Y. 1937	F.Y. 1938	Increase or Decrease	No. of Supporting Statement
Production Costs & Utilization Investigations	\$ 7,320	\$ 17,320	\$+10,000	10
Statistics	3,480	3,480	None	
Investigation of wood treatment	800	800	None	
<b>Total</b>	<b>\$ 11,600</b>	<b>\$ 21,600</b>	<b>\$+10,000</b>	

Approximately 35 percent of the 105 billion board feet of timber in the Inland Empire is primarily a forested region. Lumbering is and must continue to be the major industry. Approximately 35 percent of the 105 billion board feet of timber is privately owned. This timber is generally the most accessible, the best in quality, and occupies the most productive forest growing sites. Sixty percent of the cut now comes from the private lands. In parts of the region cutting has progressed so far that sustained yield management on anything like the present cut is already impossible. As a result, a number of forest communities have become decadent and others are rapidly tending towards that end. Due to economic conditions and for lack of sound information on production costs and returns, most private operators are liquidating their investments in stumpage as rapidly as possible by clean cutting. Results of previous production costs and utilization studies at this Station have indicated that clear cutting is seldom, if ever, the most profitable method. By the proper selection of the trees to be cut it is probable that a growing reserve of the smaller trees can be left without cost and possibly at a greater profit to the operator. Such a method may make permanent private forestry profitable in the region. Present funds for production costs



R-NRM

Supporting Statement No. 10

Appropriation Estimates

F.Y. 1938

Forest Products

Production Costs & Utilization Inves.

JUSTIFICATION FOR APPROPRIATION INCREASE

The Inland Empire is primarily a forested region. Lumbering is and must continue to be the major industry. Approximately 35 percent of the 105 billion board feet of merchantable timber is privately owned. This timber is generally the most accessible, the best in quality, and occupies the most productive forest growing sites. Sixty percent of the entire cut now comes from these private stands. In parts of the region cutting has progressed so far that sustained yield management on anything like the present cut is already impossible. As a result, a number of forest communities have become decadent and others are rapidly tending towards that end. Due to economic conditions and for lack of sound information on production costs and returns, most private operators are liquidating their investments in stumpage as rapidly as possible by clean cutting. Results of previous production costs and utilization studies at this Station have indicated that clear cutting is seldom, if ever, the most profitable method. By the proper selection of the trees to be cut it is probable that a growing reserve of the smaller trees can be left without cost and possibly at a greater profit to the operator. Such a method may make permanent private forestry profitable in the region. Present funds for production costs



and utilization investigations at this Station are insufficient to study more than one typical operation every two years. Within this region there are five commercially important timber types comprising many different conditions and operations in which such studies are urgently needed. The \$10,000 increase for this work would allow three comprehensive production costs and utilization studies during every two-year period.

white Pine Economic measures \$ 20,000. \$ 20,000. 11

1/ Based on present information 5/25/36

and the forest of white pine is seriously challenged. The feasibility of white pine forestry in the region. There has been, as a result, a very rapid and disturbing downward in private land ownership. Nearly 1/4 million acres of white pine land have passed to the public through the relinquishment and more than 100,000 acres have been donated to the Federal Government. All of this, in spite of the fact that white pine produces the most valuable timber of any of our western species. The primary management of white pine in this type requires a comprehensive study to determine (1) the extent of and the specific losses for forest land relinquishment; (2) the financial returns to be expected under private, State, or Federal ownership; and (3) the feasibility of sustained yield management for the type. The allotment of \$20,000 to this section will be required to properly prepare the initiation of this project.



R-NRM  
Appropriation Estimates  
R-NRM 1938  
Estimates  
F.Y. 1938

Supporting Statement No. 11

JUSTIFICATION FOR APPROPRIATION INCREASE  
FOREST ECONOMICS (Financial Project)

Lumbering in the white pine forests of northern Idaho

is the major industry and the only support for many communities.

F.Y. 1937 F.Y. 1938 Increase No. of

The future of the industry is in 1/2 balance. The higher cost Supporting

Decrease Statement

of carrying land, due to heavy fire control costs, timber taxes,

White Pine Economics measures \$ Necessary \$ 20,000 \$ +20,000 type, 11

and the threat of blister rust damage seriously challenges the  
feasibility of private forestry in the region. There has been,  
as a result, a very rapid and disturbing breakdown in private

land ownership. Nearly 1/4 million acres of cutover land have

1/ Based on present information 3/25/36

passed to the counties through tax delinquency and more than

175,000 acres have been donated to the Federal government. All

of this, in spite of the fact that white pine produces the most

valuable lumber of any of our western species. The orderly

management of timberlands in this type requires a comprehensive

study to determine (1) the extent of and the specific causes

for forest land delinquency; (2) the financial returns to be

expected under private, State, or Federal ownership; and (3)

the feasibility of sustained yield management for the type.

The allotment of \$20,000 to this Station will be required to

properly finance the initiation of this project.



R-NRM

Appropriation Estimates

F.Y. 1938

Forest Economics

White Pine Economics

SURVEY OF FOREST RESOURCES (Financial Project)JUSTIFICATION FOR APPROPRIATION INCREASE

Lumbering in the white pine forests of northern Idaho is the major industry and the only support for many communities. The future of the industry is in the balance. The high cost of carrying land, due to heavy fire control costs, timber taxes, costly silvicultural measures necessary to perpetuate the type, and the threat of blister rust damage seriously challenges the feasibility of private forestry in the region. There has been, as a result, a very rapid and disturbing breakdown in private land ownership. Nearly 1/4 million acres of cutover land have passed to the counties through tax delinquency and more than 175,000 acres have been donated to the Federal government. All of this, in spite of the fact that white pine produces the most valuable lumber of any of our western species. The orderly management of timberlands in this type requires a comprehensive study to determine (1) the extent of and the specific causes for forest land delinquency; (2) the financial returns to be expected under private, State, or Federal ownership; and (3) the feasibility of sustained yield management for the type. The allotment of \$20,000 to this Station will be required to properly finance the initiation of this project.



R-NRM

Estimates of Timber

F.Y. 1938

Survey of Forest Resources

Present &amp; Future Requirements

SURVEY OF FOREST RESOURCES (Financial Project)

The early completion of the Forest Survey for the Northern Rocky Mountain region, which F.Y. 1937 F.Y. 1938 Increase or Decrease No. of Supporting Statement

and northeastern Washington is now in progress. This region includes 56 million acres, of which approximately one-

Survey of Forest Resources \$ 20,000 \$150,000 \$+110,000 18

Present & Future Requirements timber now greatly exceeds the sustained yield and

is distributed over the region with little regard to the welfare

and security of the dependant communities and towns. The prepara-

tion of logical and economically sound sustained yield timber

1/ Based on present information 3/25/36. cooperation between

public and private ownership, and the determination of the maxi-

mum contribution which the timber resource can make towards

rehabilitation of the social order can be had only after the

completion of the Forest Survey in all of its phases.

The Survey of forest resources for the Northern Rocky Mountain region can be completed with an increase in the allotment to this Station of \$110,000. This increase is figured on the basis that a like amount (\$110,000) will have been allotted from emergency funds in addition to the regular allotment of \$20,000 for F.Y. 1937.



R-NRM  
Appropriation Estimates  
F.Y. 1938  
Survey of Forest Resources  
Present & Future Requirements

Supporting Statement No. 12

JUSTIFICATION FOR APPROPRIATION INCREASE

The early completion of the Forest Survey for the Northern Rocky Mountain region, which includes Montana, northern Idaho, and northeastern Washington, is urgent. The timbered portion of this region includes 36 million acres, of which approximately one-half has been covered by the Survey. Within this region the annual cut of timber now greatly exceeds the sustained yield and is distributed over the region with little regard to the welfare and security of the dependent communities and towns. The preparation of logical and economically sound sustained yield timber operations, plans, a decision as to the proper division between public and private ownership, and the determination of the maximum contribution which the timber resource can make towards rehabilitation of the social order can be had only after the completion of the Forest Survey in all of its phases.

The Survey of forest resources for the Northern Rocky Mountain region can be completed with an increase in the allotment to this Station of \$110,000. This increase is figured on the basis that a like amount (\$110,000) will have been allotted from emergency funds in addition to the regular allotment of \$20,000 for F.Y. 1937.



R-NRM  
Estimates  
F.Y. 1938

JUSTIFICATION FOR APPROPRIATION INCREASE

Much of the experimental work in forest and range research must be carried on in the field under natural conditions. To serve

IMPROVEMENT CONSTRUCTION

Item	Ave. of 5-year period, F.Y. 1938 to F.Y. 1942	Supporting Statement No.
No. or miles	Annual need for improvement constr.	No.
Office & Laboratories	4 : \$ 6,000	
Residences, 2 to 5-room	18 : 13,500	
Dormitories	5 : 4,000	
Mess Halls	3 : 3,000	
Water Systems	2 : 800	
Light Plants	3 : 1,500	
Garages	3 : 600	
Sewage Systems	3 : 500	
Shops	3 : 600	
Barns and Granaries	2 : 500	
Gas Houses	3 : 300	
Stock Wells	8 : 900	
Telephone Lines	8 : 400	
Range & Pasture Fences	40 : 2,800	
Roads	30 : 8,100	
Trails	25 : 1,500	
	-- : \$ 45,000	13

of Federal forest research agencies. Others are urgently needed.

Development of the established forests and ranges have been extremely slow, due to limited regular funds. A continuing annual appropriation over the next five-year period of \$45,000 is needed to develop the present established experimental forests and ranges to a point where they will become usable centers for field work.



R-NRM  
Appropriation Estimates  
F.Y. 1938  
Appropriation Estimates  
F.Y. 1938  
Improvement Construction

Supporting Statement No. 14  
Supporting Statement No. 13

JUSTIFICATION FOR APPROPRIATION INCREASE

Much of the experimental work in forest and range research must be carried on in the field under natural conditions. To serve this purpose certain areas have been carefully selected and set aside as experimental forests and ranges. In order to fulfill their objectives as field centers for experimental work, such areas must be developed. Well located field headquarters must be established providing, in addition to the physical plant setup, useable office and laboratory space and comfortable living quarters for the project workers. A system of protection and utilization roads and observation towers must be constructed, range and pasture fences built, and stock water holes and wells developed. Six experimental forests and ranges scattered throughout the Northern Rocky Mountain region have been set aside for the use of Federal forest research agencies. Others are urgently needed. Development of the established forests and ranges have been extremely slow, due to limited regular funds. A continuing annual appropriation over the next five-year period of \$45,000 is needed to develop the present established experimental forests and ranges to a point where they will become useable centers for field work.

1/ All labor costs included.

A continuing annual appropriation over the next five-year period of \$6,000 is needed to maintain the permanent improvements that have been built on the already established experimental forests and ranges.



JUSTIFICATION FOR APPROPRIATION INCREASE

The expansion in permanent improvements made possible by use of emergency funds during the past few years have built up a maintenance load which can no longer be met as an incidental expense against research project funds or through small allotments from regional improvement funds.

The following tabulation shows the number of improvements by types, and the annual maintenance needs averaged over the next five-year period:

Class	Average of 5-year period		
	Miles	Unit	Annual
	or	maintenance	maintenance
	no.	cost 1/	
Roads	90	4 28	2,520
Trails	105	4	420
Firebreaks	3	50	150
Buildings	62	31	1,922
Fences	67	6	402
Telephone and Power Lines	32	11	352
Miscellaneous	18	14	252
Total			6,018

1/ All labor costs included.

A continuing annual appropriation over the next five-year period of \$6,000 is needed to maintain the permanent improvements that have been built on the already established experimental forests and ranges.



3. Suggestions for Cooperating Bureaus Relative to the  
Assignment of Specialists for Additional Work under  
the McSweeney-McNary Act.

This Station becomes more in need of cooperative assistance from the Bureau of Plant Industry by the assignment of a forest pathologist. Many of our projects in silviculture, in both grazing and silviculture the best quality of products, and fire encounter obstacles or phases which require the services of a trained pathologist for their solution. This is, of course, especially true in the silvicultural management of western white pine, where the control of blister rust at the lowest possible cost is a most important problem. The control or possible elimination of the blister rust host ribs by increasing the tree-crown density is a possible method of less expensive control which needs the assistance at once of a trained pathologist at this Station. Studies of seedling diseases and stem and root rots in the white pine type, particularly in relation to the development of desirable methods of cutting practices are likewise needed. Pathological problems also are numerous in the harvesting of timber and the storage and use of wood products. In fire control, the lopping and piling, and the effect of shade of residual stands on rate of decay of slash, are factors which influence the period of high rate of spread of fire; hence, increased costs of forest protection.

Similar cooperation is also needed from the Bureau of Conservation Service also has continual need of both region-Biological Survey. The assistance of a biologist to study rodents as a factor in the regeneration of western white and



ponderosa pine stands is needed. Mice, chipmunks, squirrels and other seed-consuming rodents are known to make material inroads on the seed crops of these desirable species. No information is available on this important regeneration factor. It demands for complete and accurate meteorological data. In both grazing and silviculture the best quality of product is unobtainable if the soil is materially disturbed by agriculture or fire. A trained biologist from the Bureau of Chemistry and Soils is needed to determine the physical, chemical, and biological limits of soil disturbance permissible under forest and range management. A fourth specialized need was brought out repeatedly during our recent Investigative Council meeting. In grazing the correlation between forage crop and weather is known to be high and the determination of effect of grazing practices on sustained forage production is impossible without accurate allowance for the effects of current weather. In forest pathology and entomology only a beginning has been made in taking advantage of the weather to reduce the cost of fungi and insect control. In silviculture the growth rate and the prediction of future yields must be correlated with weather and climate before private forestry can be definitely informed of its prospects. And in fire control the effect of weather is too well known to need more mention. The Soil Conservation Service also has continual need of both region-



wide and localized weather measurements. The design and operation of a control network of stations should reduce the costs and improve the practices of all these agencies. 1. Experimental Forests, Ranges, and Other Centers of Work. The Northern Rocky Mountain Forest and Range Experiment Station now has established four experimental forests and two experimental ranges. Table 4-a, which follows, lists these six experimental areas, gives their location, date of establishment, area in acres, and the situation as to forecasting and agricultural statistics work done by the improvements. Following the table a brief description is given of each of the forests and ranges. Weather Bureau that a cooperative assignment by that Bureau is not recommended. A more detailed statement of this proposal is in course of joint preparation by the several forests and agricultural agencies in this region.

Excellent cooperation is being received from the Bureau of Entomology and Plant Quarantine through its Forest Insect Field Station at Coeur d'Alene, Idaho. Transfer of the headquarters of the station to Missoula, Montana, upon completion of the new addition to the Forest Service will facilitate cooperation.



#### 4. Experimental Forests, Ranges, and Other Centers of Work.

The Northern Rocky Mountain Forest and Range Experiment Station now has established four experimental forests and two experimental ranges. Table 4-a, which follows, lists these six experimental areas, gives their location, date of establishment, area in acres, and the situation as to improvements. Following the table a brief description is given of each of the forests and ranges.

Name	Location	Date established	Area in acres	Buildings & Improvements
Priest River Experimental Forest	Priest River, Idaho	4/4/31	6104	23
Deception Cr. Experimental Forest	Cedar & Albion, Idaho	8/21/35	5741	31
Carex Experimental Forest	Idaho	5/21/35	7123	0
Marine Experimental Forest	Idaho	5/21/35	8555	0
Port Neff Experimental Range	Idaho	1/25/35	7530	0
Alber Experimental Range	Idaho	1/25/35	7530	0

\*Used in cooperation with Bureau of animal industry.



# Experimental Forests, Ranges, and Other Centers of Field Work

## Experimental 4-a.--Established Forests and Ranges

Name	Location	Date established	Buildings & Improvements:				Other Improvements					
			Area acres	Hdqtrs. No.	Temp. No.	Stations	Roads miles	Trails miles	Fire lines	Fences miles	Tel. & trans. lines	Other
Priest River Experimental Forest	Priest River, Idaho	4/8/31	6104	20	0		22.5	30	1.6	6.5	16	1
Deception Cr. Experimental Forest	Coeur d'Alene, Idaho	6/21/33	5541	11	0		17.8	10	0	0	0	1
Coram Experimental Forest	Citadel, Montana	6/21/33	7328	0	0		9.1	30.0	0	0	0	0
Bernice Experimental Forest	Basin, Montana	4/8/31	2909	0	0		5.0	0	0	0	0	0
Fort Keogh Experimental Range **	Miles City, Montana		60870	5	7		5.0	0	0	28.6	6.5	10
Vigilante Experimental Range	Alder, Montana	7/29/35	7500	6	0		4.0	0	0	5	0	0

\*\*Used in cooperation with Bureau of Animal Industry.



date 22½ miles of road, and 50 miles of trails. The protection system of roads, trails, lookouts, and fire lines

Priest River Experimental Forest

The Priest River experimental area was selected in September, 1911, and work there by members of the Station staff has been in progress continuously from the beginning. No official order establishing this experimental forest was issued, however, until April 8, 1931. The Priest River area satisfactorily represents the northern limits of the western white pine type. Approximately 5,461 acres of the total area of 6,104 acres are in commercial timber land. About 1,541 acres bear merchantable timber (mostly decadent climax forest), 3,613 acres immature timber, and 804 acres are cut-over land which are for the most part reproducing

Desolation Creek Experimental Forest

satisfactorily. Due to the decadent climax type of merchantable timber, the number of possible sales for cutting demonstrations is limited. Most of the silvicultural studies have been conducted in the immature stands of timber. This experimental forest was established in June, 1933, as a center for silvicultural studies in the central portion of the range of western white pine. The Forest contains 3,561 acres, all of which is commercial forest

land. During the last few years the Priest River Experimental Forest has become the field center for fire research activities. Here are established the fuel moisture and fire weather master stations with their instruments and equipment. Field experiments in fire behavior are carried on in or adjacent to this Forest. Approximately 2,384 acres are covered with timber of merchantable size, 960 acres contain immature or pole-sized timber, and 180 acres are in seedlings and saplings. The volume of merchantable timber is estimated to be 70 million board

A complete protection and utilization road system for the Forest has been planned. There have been built to



growing condition. It is ample in amount to make small sales date 22½ miles of road, and 50 miles of trails. The protection system of roads, trails, lookouts, and fire lines is approximately 85 percent complete. It is not planned to hurry the utilization road system to completion inasmuch as a majority of the commercial forest is still immature.

A heavy building construction program is now underway at the field headquarters of this Forest, which when completed will provide one of the most complete and up-to-date plants on any Experimental Forest in the Service.

C. C.C. camp F-127 is located a short distance from Station headquarters and a majority of the men and money have been allocated to Station work over the past two years.

#### Deception Creek Experimental Forest

This experimental forest was established in June, 1933, as a center for silvicultural studies in the central portion of the range of western white pine. The Forest

The protection system of roads, trails, and lookouts contains 3,541 acres, all of which is commercial forest land. The greatest portion of the forest is represented by the old mature age class of 161-200 years. Approximately 2,384 acres are covered with timber of merchantable size, 960 acres contain immature or pole-sized timber, and 160 acres are in seedlings and saplings. The volume of merchantable timber is estimated to be 70 million board feet of which 39 million is western white pine. The bulk of the timber is 160 years old, sound, thrifty, and in a easily accessible and readily saleable.



growing condition. It is ample in amount to make small sales of a few million feet and thus render it possible to carry out experiments in methods of cutting and other cultural operations through a period of years. The timber is readily saleable and the utilization road system has developed to a point where it is all accessible. Concentrated in the immediate vicinity of the experimental area are many early timber sale cuttings upon which different silvicultural methods were tried out, thus making the forest an ideal center for research in forest management.

Although the area was not established as an experimental forest until 1933, very satisfactory progress has been made both as to experimental work done and improvements made. An up-to-date superintendent's dwelling, a four-room cottage, four-car garage, workshop, temporary office, temporary mess hall, and weather station have been constructed besides other minor improvements.

The protection system of roads, trails, and lookouts contains 7,528 acres, of which approximately 5,528 acres is about 75 percent completed. Approximately 18 miles of roads and 10 miles of trail have been built to date. A very efficient system of utilization roads has been planned which will be rushed to completion as rapidly as funds will permit. A high-class forest highway passing through the center of the forest and connecting the city of Coeur d'Alene, Idaho, with the main timber bodies on the Coeur d'Alene National Forest will make all the timber on the experimental area easily accessible and readily saleable.



Timber is being sold at the rate of about 1,000 M. per year which affords excellent opportunity for the demonstration of various methods of management. Improvement thinnings are being made and some planting done on broadcast burned areas. The blister rust and insect control work has been completed on the area. A bulk of the work and funds of C.C.C. camp F-137 has been allocated to Station work during the past two summers.

system of roads, trails, and lookouts is about 30 percent complete. Although Coram Experimental Forest

This area, located on the Flathead National Forest, was established in June, 1933, as an experimental forest for the larch-Douglas fir type. It meets satisfactorily the requirements of being representative of the type and of having reasonable diversity of sites, aspects, age classes, and composition so far as spread in these factors

can be found within an area of moderate size. The Forest contains 7,328 acres, of which approximately 5,628 acres are capable of producing commercial timber, and 1,700 acres are non-commercial forest mostly above 5,000 feet in elevation. An area of some 800 acres is being set aside for a natural area. Seventy-five percent of the commercial forest land bears merchantable timber, 7 percent bears pole stands, and 18 percent is in reproduction. The estimated volume in merchantable timber is 91,962 M. feet log scale of which 92 percent is larch and Douglas fir.



Because of lack of funds for research work in forest management in the larch-fir type, the area is undeveloped experimentally. Spike camp of C.C.C. enrollees and an ERA crew have made it possible to build some needed roads and trails. There are now nine miles of road and 30 miles of trail on the area. During the past season the right-of-way was cleared for additional road mileage. The protection system of roads, trails, and lookouts is about 50 percent complete. Although a detailed system of utilization roads has been planned, it is doubtful if much work can be accomplished during the coming field season.

No field station buildings have yet been constructed. The Coram District Ranger's headquarters (Flathead National Forest) are located just adjacent to the area and the Ranger has supervised the C.C.C. and ERA crews.

#### Bernice Experimental Forest

The Bernice area was selected as a lodgepole pine experimental forest in 1914, but no official order of establishment was issued until April 8, 1931. The tract contains 2,909 acres and is located on the Deerledge National Forest in Montana. The area can be reached in a little over an hour's drive from Butte, and in about five hours' drive from Missoula. It is six miles from the railroad. This experimental forest very satisfactorily represents the lodgepole pine type of central Montana.



There is an unusually good distribution of age classes.

An intensive topographic and timber survey was made in 1914-1915. According to this survey productive timber land comprises 1,955 acres of the area, grassland 813 acres, and brush and barren, 141 acres. About 802 acres bear merchantable timber and 869 acres immature timber.

The area contained a total of 6,182 M. feet log scale of timber in 1914 of which 4,456 M. was lodgepole pine.

Old cuttings and some clean and some selective, found on the area, furnish excellent conditions for study.

A used road runs just within and parallel to the east boundary of the area for approximately  $1\frac{1}{2}$  miles. A

road about  $3\frac{1}{2}$  miles long was built westward into the

area in 1917. The roads make most of the forest accessible

even though there are no trails. No buildings or other

improvements have been constructed on this Experimental

Forest. No funds have as yet been appropriated for forest

management research in this timber type, so practically

no experimental work has been done on the area by this

Station. A natural area inside the forest will be

selected for establishment during the coming field

season. at Guster Flats for the new sheep project.

An ERA crew of 12 to 15 men were employed at this Station

from August to December, 1935. A fifteen-man crew for

March and April will use up the present ERA allotment.

This crew is now at work on the sheep project fences.



Vigilante Experimental Range

Fort Keogh Experimental Range

The U. S. Bureau of Animal Industry had established at old Fort Keogh, near Miles City, Montana, a U. S. Range-Livestock Experiment Station. This station is located in the short grass ranges of the Northern Great Plains and comprises some 60,879 acres. Cooperative arrangements were made between this Station and the U. S. Range Livestock Experiment Station to use portions of their range and facilities to study the best methods of rehabilitation, utilization, and balanced management for the type of range common to the Great Plains Region. Experimental studies in range management under this cooperative agreement have been underway since 1932.

Headquarter improvements built from Station funds at Miles City during the past two years include a five-room dwelling for the superintendent, two garages, and a remodeled barracks for an office. Another dwelling, a more adequate office and laboratory, and a bunkhouse are all needed rather badly there. All funds now in prospect will be required during the coming season to complete some the fences, a two or three-room field dwelling, and a barn needed at Custer Flats for the new sheep project.

An ERA crew of 12 to 15 men were employed at this Station from August to December, 1935. A fifteen-man crew for March and April will use up the present ERA allotment. This crew is now at work on the sheep project fences.



### Vigilante Experimental Range

The Vigilante area was established as an experimental range in April, 1935. It was selected to afford an experimental area for the study of the high mountain summer range conditions so common to our National Forests. This area, located on the Ruby River District of the Beaverhead National Forest, consists of about 7,500 acres of typical summer range or sufficient to carry 125 head of cattle and 1,500 head of sheep for the usual summer grazing season.

About 50 percent of the area is occupied by grass land and about 20 percent by sagebrush range that provides some of the best summer feed in western Montana. Nearly 20 percent of the area included in the experimental range is timbered with young to mature lodgepole pine and Douglas fir timber of rather poor quality, mostly below sawlog size but fairly typical of this part of the State. The area was covered by an intensive type of range survey in 1925-1926. Demand for range from nearby ranches very greatly exceeds the supply.

Besides regular range research the area offers some possibilities for detailed study of erosion, the effects of which are now noticeable in numerous places.

Field station headquarters occupy the former Ruby District Ranger Station. There are six buildings in fairly good condition. Four miles of road and five miles of fencing are now within the area. During the past season an ERA



crew was employed in cutting fence posts and poles. Considerable fencing is necessary before much, if any, experimental work can be gotten underway. The Station will cooperate with the Beaverhead Forest in constructing a telephone line from Virginia City to the Ruby Ranger Station. Little or nothing can be accomplished towards the headquarters needed at this newly established experimental range unless regular funds expected for F. Y. 1937 are supplemented to a substantial degree by emergency funds.

#### Proposed Experimental Forests and Ranges

Experimental forests have been established covering three of the four major timber types within the region. Two of them, the Priest River and Deception Creek forests, represent the northern and the central portions, respectively, of the range of the western white pine type in North Idaho. The Coram area located on the Flathead National Forest in Montana is established as an experimental forest for the larch-Douglas fir type. The Bernice

Forest on the Deerlodge National Forest is typical of the

lodgepole pine type which covers large areas in Montana.

No experimental forest has yet been established in the

very important ponderosa pine type. An area in the south

end of the white pine range is also badly needed as a

center of work for this most productive subregion.

Considerable work has been done during the past two years



## Clearwater Experimental Forest

in examining suitable areas.

There are three major range conditions which must be studied and the use of which must be correlated before a sound, balanced range-use program for Montana can be developed. These are the short-grass ranges of the Northern Great Plains, the high mountain summer ranges of the National Forests, and the foothill, spring-fall ranges of Central Montana. The first condition is covered by the existing station near Miles City, Montana, and the second by the recently established Vigilante Experimental Range on the Beaverhead National Forest. The Rochester Basin area is proposed for an experimental range covering the third condition, foothill, spring-fall ranges.

Table 4-b below lists the proposed experimental forest land ranges. The table is followed by a brief description of these experimental areas, giving the present status in each case.

### 4-b.--Experimental Forests or Ranges (Proposed)

Name	Location	Est. area: acres	Purpose
Clearwater Experimental Forest	Pierce, Idaho	1,206	Forest management studies in the important white pine type in its southern range limit.
Pleasant Valley: Experimental Forest	Marion, Montana	17,520	Forest management studies in a ponderosa pine forest.
Rochester Basin: Experimental Range	Melrose, Montana	101,266	Range management studies in spring-fall foothill ranges.

present Congress. With legal action authorized it might prove possible to work out some provisions whereby one



or the other of the areas might be acquired for experimental purposes.

### Clearwater Experimental Forest

(Proposed)

As stated previously in this discussion, an area in the south end of the white pine range is badly needed as a center of work. The southern portion of the white pine range occupies the most favorable location from the standpoint of soil and climate. The predominating age class is 100 to 120 years old. In 1934, some twelve areas were examined, but no suitable tract could be found on National Forest land. An area of two sections owned by one of the large timber companies was examined and found to be ideal in every way and could be purchased for the commercial stumpage involved. A formal report was prepared which will be submitted if and when the allotment of funds for acquisition are large enough to permit of sizeable purchases of virgin timber in the West. Another area in the same locality, owned by the State, was examined and found to be fairly suitable to the Station needs. The State officials responsible for State lands in Idaho favor the dedication of this timber tract for research use.

There is a possibility that either area might be acquired through exchange. It is understood that a bill of proposing additions to the Clearwater National Forest through exchange is being prepared for submission to the present Congress. With legal action authorized it might prove possible to work out some provisions whereby one



or the other of the areas might be acquired for experimental purposes.

Pleasant Valley Experimental Forest

(Proposed)

As previously noted, an experimental forest in the ponderosa pine type is urgently needed. Unfortunately, the bulk of the good accessible ponderosa pine timber passed to private ownership prior to the creation of the National Forests, and, therefore, no suitable areas are in federal ownership. One desirable area (Pleasant Valley) belonging to the A. C. M. Company, and outside the National Forests, may possibly be acquired either by purchase or exchange. There is little probability that an exchange can be consummated because of the small volume of timber sales in Montana. Latest information is that the company does not now wish to sell, but there is always possibility of sale if agreement as to values can be arrived at. A formal report recommending the selection of this tract as a purchase area by the National Forestry Reservation Commission has been prepared and is being held pending the allocation of a sizeable fund for acquisition of virgin timber in the West. In view of the fact that allocation of sizeable funds for acquisition of virgin timber in the West has become quite remote, further consideration will have to be given to the much less suitable areas within the National Forests.



primarily to Rochester Basin Experimental Range to timber  
operator, should be carried (Proposed) lands and under conditions

This area, containing approximately 101,266 acres,  
is typical of the spring-fall foothill ranges of Central  
of Montana. It is ideally suited for experimental work not  
only for the above reason, but also because of its  
accessibility both to the railroad and to the main traveled  
highways. The area was covered in 1934 by an extensive  
grazing-erosion survey. The formal establishment report  
has been prepared and submitted to Washington. Due to  
the fact that this area contains a large amount (approx-  
imately 60 percent) of public domain, its formal dedication

to research must await a decision as to a division of  
responsibility between departments. The Rochester Basin  
Range is so desirable and the choice of areas within  
the National Forests so poor that it seems desirable  
to await a decision.

Other Centers of Experimental Work

In order to make the results of certain studies  
applicable throughout a region or representative of the  
varying conditions within the entire range of a forest  
type or range cover, the selection of field study plots  
cannot be confined to established experimental areas  
most of which are within National Forests. Selective  
logging studies, for example, which are conducted



### 3. Natural Areas

primarily to provide data for the use of the private timber operator, should be carried out on lands and under conditions in this Region. This is the Teepee Creek Natural Area on the Kanikau National Forest. It comprises an area of 745 acres which are set aside to preserve in natural state a typical stand of climax type western white pine as it occurs on the lower slopes. Three other natural areas plots scattered throughout the entire range of tree species may also be classed as having been set aside as they are within the region studied. The entire region should serve as a field laboratory for experimental work. Tables 4-c and 4-d below list the number and acreage of the other main centers of work and the permanent sample plots.

#### 4-c.---Other Centers of Field Work

Location	Area in acres	Purpose
Greenough, Montana	19	Selective logging studies - ponderosa pine type.
Grangermont, Idaho	19	Selective logging studies - western white pine type.
Frenchtown, Montana	120	Improvement thinnings.
Ninemile, Montana	5	Improvement thinnings.
60 reseeding areas chiefly eastern Montana	592	Artificial reseeding on abandoned dry farm lands.
64 the	755	

#### 4-d.---Permanent Sample Plots

Project	Number	Area in acres
Silviculture & Survey	267	200.0
Range	256	2.5
Total	523	202.5

in the ponderosa pine, lodgepole pine, Douglas fir, western



## 5. Natural Areas

Only one natural area has been established to date in this Region. This is the Tepee Creek Natural Area on the Kaniksu National Forest. It comprises an area of 746 acres which are set aside to preserve in natural state a typical stand of climax type western white pine as it occurs on the lower slopes. Three other natural areas may also be classed as having been set aside as they are within established experimental forests. These are the Sanno area on the Priest River forest, the Montford Creek area on the Deception Creek forest, and the Coram area on the Coram forest. Formal reports definitely setting aside these areas are being made.

Two other natural areas have been selected and formal reports are being prepared. One, the Salikwa area on the Kaniksu National Forest will preserve some 1,000 acres of climax type white pine as it occurs on low elevation timbered flats. The second is an area of approximately 440 acres of climax type white pine in the southern limits of its range on the Musselshell District of the Clearwater National Forest.

Several examples in the natural state of the white pine type in the central portion of its range should be reserved. The Coeur d'Alene and St. Joe National Forests will be examined during the coming season and suitable areas will be selected for establishment. Natural areas in the ponderosa pine, lodgepole pine, Douglas fir, western



red cedar, and Engelmann spruce types need also to be selected and established. A natural area of lodgepole

#### 6. Erosion-Streamflow Investigations

pine will be selected on the Bernice Experimental Forest

The program of erosion-streamflow work, as proposed in this summer and the report prepared.

May, 1935, for this station, was made up of four projects. Two

There follows a table listing the natural areas of these were to be intensive studies, one for the western

which have been established or selected for establishment white pine and one for the mixed conifer type, and two supple-

together with the acreage involved and the timber type mental studies, one for the spring-fall foothill ranges of

preserved. western or central Montana, and one for the shortgrass ranges

of eastern Montana. It is believed that this plan is adequate

and no change is proposed at this time.

Name	Location	Area : Acres	Type	Preserved
			Established	
Sanno	Priest River	1034	Climax type, western white	
	Exp. Forest, Idaho		pine, upper altitudinal	
			limits	
Montford Crk.	Deception Cr.	336	Virgin mature, 160-year old	
	Exp. Forest, Idaho		western white pine	
Coren	Coren Exp. Forest, Montana	798	Virgin mature, larch-Douglas fir	
Tepee Cr.	Kaniksu Natl. Forest, Idaho	746	Climax type, western white	
			pine, lower slopes	

Ready to be Established				
Salikwa	Kaniksu Natl. Forest, Idaho	1000	Climax type, western white	
			pine, flats	
Musselshell	Clearwater Natl. Forest, Idaho	440	Climax type, western white	
			pine, southern limits	

Soil Conservation Service informally suggested to Mr. Watts recently the possibility of providing U.S.G. funds to start this work in the white pine type and that Mr. Remple made a



## 6. Erosion-Streamflow Investigations

The program of erosion-streamflow work, as proposed in work at Miles City in connection with our range management project, Mr. Semple renewed the suggestion to Mr. Hurtt at the recent Pullman meeting of the Soil Conservation Service white pine and one for the mixed conifer type, and two supplemental studies, one for the spring-fall foothill ranges of western or central Montana, and one for the shortgrass ranges of eastern Montana. It is believed that this plan is adequate than a preliminary study this season on the ground of the and no change is proposed at this time.

Mr. Watts spent some time last fall and summer looking over drainages in the white pine type and was favorably impressed with an area on French and Tamarack Creeks on the Clearwater National Forest, but no area was finally selected for the study as he planned to canvass the field somewhat more thoroughly before making a final decision. Just before Mr. Watts left for Milwaukee he stated that he would be very glad to help out with further field examinations in selecting the area in the white pine type and suggested that Director Bailey, and possibly others, should be asked to participate. This offer and suggestion should be followed.

It is understood that Mr. Rockie or someone from the Soil Conservation Service informally suggested to Mr. Watts recently the possibility of providing S.C.S. funds to start this work in the white pine type and that Mr. Semple made a



somewhat similar suggestion to Mr. Chapline regarding erosion work at Miles City in connection with our range management project. Mr. Semple renewed the suggestion to Mr. Hurtt at the recent Pullman meeting of the Soil Conservation Service and intimated that Mr. Chapline was agreeable to such a setup in connection with the sheep project now being started there. Hurtt questioned the advisability of attempting more than a preliminary study this season on the ground of the possibilities of such a setup.

Important questions of policy and cooperative relations are involved by these suggestions which should be considered in Washington. So far as is known, there has been no change in the policy mentioned in Mr. Chapline's letter of June 25, 1935, when a somewhat similar question was raised originally by Mr. Rockie. Under all the circumstances and in the absence of definitely selected areas and procedure this office does not favor starting either project this season even though the Soil Conservation Service might be willing to provide all the funds. However, if an allotment of Forest Service funds should be made the white pine area should be selected and a start made.

2. Title: Reproduction on Cutover Areas in the Western White Pine Type.

Authors: Haig, I. T. and Wellner, C. A.

When Ready: The manuscript is about 85% complete. Will be submitted to Washington for publication by January 1, 1937.



5. Title: Natural Reproduction of Western White  
7. Governmental Publications

The need of more publications, of better quality, and issuance with less delay, was stressed several times at our recent Investigative Council meeting. Cases were cited in which applicable information was withheld from general use for periods of two, or even three, years by failure to publish promptly. Research is readily justifiable if it results in improved routine practices, but it cannot produce such improvements until the research findings and recommendations are made available to the potential users. Publication is the only means to this end.

The following manuscripts now in preparation at this Station are destined for governmental publication:

1. Title: Manual on Stand Improvement Methods for Northern Rocky Mountain Region.

Authors: Davis, K. P. and Region One.

When Ready: January 1, 1937. This manual will be mimeographed for use in field during 1936. It will be checked and revised, if necessary, and submitted to Washington for publication January 1, 1937.

2. Title: Reproduction on Cutover Areas in the Western White Pine Type.

Authors: Haig, I. T. and Wellner, C. A.

When Ready: The manuscript is about 85% complete. Will be submitted to Washington for publication by January 1, 1937.



RE-NHM  
3. Title:

Natural Reproduction of Western White  
Pine. Forest Resources, Present and Future

Authors:

Haig, I. T. and Weidman, R. H.

When Ready:

The time when this manuscript is ready  
for transmission to Washington depends  
upon when I. T. Haig can complete his  
part in cooperation with R. H. Weidman.  
Probably not before January 1, 1937.

Gisborne's "Measuring Fire Weather and Forest

Inflammability" was submitted to the Washington Office for  
review and publication in May, 1935. "Timber Growing and

Logging Practice in the Ponderosa Pine Type of the North-  
west" by R. H. Weidman has now reached the galley proof

stage in the Washington Printing Office. Publication by  
the Government Printing Office should be assured for the  
above two publications before other obligations are made.

When completed, the following  
results will be available.

1. Inventory Phase: The area of each  
type of forest cover and the estimated stand  
by species. Regrowth conditions on cut-over  
and burned lands will be determined.

2. Depletion Phase: Rate of depletion  
by cutting, fire, insects, disease, floods,  
and any other factors.

3. Growth Phase: Growth rate in old  
stands and on restocking areas and probable  
future yields.



RE-NRM

4. Requirements Phase: Present national and local requirements in forest products and probable

FINANCIAL  
PROJECT:

Survey of Forest Resources, Present and Future Requirements. Survey organization of this Station

RESEARCH  
PROJECT:

Forest Survey. Covering Region One of the Empire Forest Service. Pacific Northwest. The project

SCOPE:

The National Forest Survey is an economic study of the timber supply situation from both the national and the regional viewpoints. It is a study of present supply with relation to local industry, transportation, and finance, and an attempt to forecast future supply and possibilities from an analysis of depletion and growth trends, all in the light of domestic requirements, present and prospective, for forest products. When completed, the following results will be available.

1. Inventory Phase: The area of each type of forest cover and the estimated stand by species. Regrowth conditions on cut-over and burned lands will be determined.

2. Depletion Phase: Rate of depletion by cutting, fire, insects, disease, floods, and any other factors.

3. Growth Phase: Growth rate in old stands and on restocking areas and probable future yields.



RE-WHM

4. Requirements Phase: Present national and local requirements in forest products and probable trends.

VINANCIAL  
STATUS:

RESEARCH  
PROJECT:

The Forest Survey organization of this Station plans as the first unit to cover the "Inland Empire Region" of the Pacific Northwest. The project will eventually cover all of Region One of the Forest Service. In order to facilitate the preparation of status sheets, the Forest Survey project has been broken down into the four phases, Inventory, Growth, Depletion, and Requirements and a status sheet prepared for each. One designated as that part of the Inland Empire in northeastern Washington.

SCOPE:

The inventory phase of the Survey consists of:

- a. Determination of the area of each type of forest cover and the estimated stand by species.
- b. Classification of the present stand according to its accessibility for conversion.
- c. Forest cover map.
- d. Determination of regrowth conditions on cut-over and burned lands.
- e. Classification of the forest area according to ownership and use policy.
- f. Classification of forest area according to its forest productivity.



RE-NRM

**FINANCIAL PROJECT:** Survey of Forest Resources, Present and Future Requirements.

**RESEARCH PROJECT:** Forest Survey - Inventory Phase.

Covering the Inland Empire Region of the Pacific Northwest. The Inland Empire is defined as Montana, west of the Continental Divide; Idaho, north of the Salmon River; and the forested counties in northeastern Washington tributary to Spokane. Three counties, Spokane, Pend Oreille, and Stevens, have been designated as that part of the Inland Empire in northeastern Washington.

**SCOPE:**

The inventory phase of the Survey consists of:

- a. Determination of the area of each type of forest cover and the estimated stand by species.
- b. Classification of the present stand according to its accessibility for conversion.
- c. Forest cover map.
- d. Determination of regrowth conditions on cut-over and burned lands.
- e. Classification of the forest area according to ownership and use policy.
- f. Classification of forest area according to its forest productivity.



RESULTS  
OF PAST  
STATUS:

An allotment of emergency funds considerably smaller than there are approximately 25½ million acres on a of forest land within the above designated region. Fifty-three percent of the above total or 13½ million acres is in the National Forests. Inventories of varying degree of intensiveness have been made of the forest resources within the National Forests. All of the Forests, however, need some checking and additional information to bring them to Survey standards and several require practically a complete job of type mapping in place. Fifteen million, eight hundred thousand acres of forest land have been mapped in place in the field and 2-inch-to-the-mile township type maps in color have been prepared for all acreage mapped. In addition, cruises have been obtained on practically all of the merchantable timber owned by the States and the large private owners. The cruises have been adjusted on ten percent of the total area. Office compilation for the work done to date will be eighty percent complete for by June 1, 1936. After deducting the area covered last summer there are still more than 10 million acres on which field work can be done without further preparation. Unless an unexpected increase in funds is received, this will be more than sufficient to cover the area which will be worked during the next field season.



RESULTS  
OF PAST  
YEAR:

An allotment of emergency funds considerably smaller than in 1934 allowed the work to progress, but on a much smaller scale than during the previous season. An average of 17 men mapped in the field from May 20 to November 1. Approximately 3,600,000 acres of land were mapped in place during that time. Sixty-one percent of the assigned area has now been covered. The three northeastern Washington Counties are done. All of Idaho is finished except the Salmon Mountain district of the Bitterroot National Forest. Three million, three hundred thousand acres of western Montana have been mapped.

Since June 1, 1935, an office force of seven E.R.A.'s, four C.C.C.'s, and one ten percenter have been doing map work and compilation. It is expected that four of the E.R.A.'s, and the ten percenter will be on the work from January 1, 1936, until the E.R.A. funds are exhausted. There is nothing definite as to the length of time the C.C.C. boys will remain.

Preparation work was done early in 1935 for an area of about 16 million acres. After deducting the area covered last summer there are still more than 10 million acres on which field work can be done without further preparation. Unless an unexpected increase in funds is received, this will be more than sufficient to cover the area which will be worked during the next field season.



PLANS

PLAN  
1937:

FINANCIAL

1937:

ASSIGNMENT

1937:

STATUS

STATUS

ASSIGNMENT

During the 1936 field season, if funds equal  
One man has been assembling and sorting  
to those now being allotted the work are received,  
the National Forest estimates since the end of  
it is the plan to concentrate more on the check  
the field season. He will continue this work  
all winter. By spring these estimates should  
of the work is lagging behind the other phases,  
be ready for field checks and correlation with  
particularly the mapping.  
the survey figures.

An allotment of funds equal to the amount we  
Work on the 1-inch-to-the-mile unit type  
are now receiving will allow for the completion of  
maps is going forward with two draftsmen and one  
check cruising in Idaho and Washington.

CCC boy assigned to it. Unit maps for about 35

In addition to check cruising, one temporary  
percent of the area covered have been made up.

man can be assigned to fire depletion and two to  
By June 1, 1936, these should be practically com-  
the growth phase. Only about two men could be used  
plete as to the area now ready for compilation.  
on mapping under this plan, but the result would be

The unit maps referred to are 30" x 48"  
to bring all phases of the work more into balance  
compilations which contain 40 townships on the  
than they are at present.  
average. On these the types are generalized

Under such a plan the Salmon Mountain District  
somewhat as compared to the 2-inch-to-the-mile  
in Idaho will be mapped and Lincoln County in Montana  
township plots, yet they form a complete and  
will be completed as to mapping in place.  
usable cover map of the forest land area. Type

Should no emergency funds be made available  
acreage figures for Benewah, Latah, and Kootenai  
during the next work period, April 1 to September 30,  
counties in Idaho and Spokane, Stevens and Pend  
it will only be possible to carry two temporary men  
Oreille counties in Washington will be prepared  
who would probably be assigned to the growth phase.  
for release during the present winter.

Check cruising and type mapping would be at a stand-  
still.

C. M. DeJarnette, T. Nowland, and M. Bradner.

percentages of species, size classes, and values in

stands of different types and ages.



PLANS  
F. M. Y. 1937:

During the 1936 field season, if funds equal to those now being allotted the work are received,

FINANCIAL  
PROJECT:

it is the plan to concentrate more on the check cruising than has been done in the past. This phase of the work is lagging behind the other phases, particularly the mapping.

RESEARCH  
PROJECT:

SCOPE:

An allotment of funds equal to the amount we are now receiving will allow for the completion of check cruising in Idaho and Washington.

STATUS:

In addition to check cruising, one temporary man can be assigned to fire depletion and two to the growth phase. Only about two men could be used on mapping under this plan, but the result would be to bring all phases of the work more into balance than they are at present.

Under such a plan the Salmon Mountain District in Idaho will be mapped and Lincoln County in Montana will be completed as to mapping in place.

Should no emergency funds be made available during the next work period, April 1 to September 30, it will only be possible to carry two temporary men who would probably be assigned to the growth phase. Check cruising and type mapping would be at a standstill.

ASSIGN-  
MENT:

G. M. DeJarnette, T. Rowland, and M. Bradner. In addition, considerable information on the percentage of species, size classes, and volume in stands of different types and ages.



RE-NFM

FINANCIAL  
PROJECT:

Survey of Forest Resources, Present and Future  
Requirements.

RESEARCH  
PROJECT:

Forest Survey - Growth Phase.  
Covering the Inland Empire region of the  
Pacific Northwest.

SCOPE:

To determine the growth rates in old  
stands and on restocking areas and the probable  
future yields.

STATUS:

Though considerable data on growth and  
yield have been collected for the white pine Douglas  
type in this region by the Forest Management  
Division of this Station, and in the ponderosa  
pine and Douglas fir types by the Pacific North-  
west Station, practically no work has been done  
to compile and correlate the results for appli-  
cation to the Forest Survey project. Very little  
work has been done in this region on growth rates  
and yields in the larch-Douglas fir, lodgepole  
pine, cedar, and spruce types. The Forest Survey  
field mappers have, since the work started, ob-  
tained for each area typed the degree of stocking,  
the age and the site. There has been collected,  
in addition, considerable information on the  
percentage of species, size classes, and volume in  
stands of different types and ages.



RESULTS  
OF PAST  
YEAR:

Due to the limited amount of funds available  
In January 1935, L. J. Cummings was  
assigned to the growth phase of the Survey. During  
the last half of F.Y. 1935 he collected all the  
available information on growth and yield applicable  
to this Region and analyzed it with a view to its  
application to the Survey project. Tentative  
work plans covering the minimum number of studies  
necessary to provide the Survey with growth rates  
and yield figures were prepared and submitted for  
discussion and approval. These plans covered the  
following studies:

- (1) Yield study of western larch - Douglas  
fir. Forest survey type maps in order  
to obtain average heights of dominant trees  
sufficient for the study. Montana.
- (2) A study of growth characteristics of  
virgin, mature ponderosa pine in complete  
the study. Montana.
- (3) A working plan for office work pre-  
liminary to a stocking correlation  
field study.
- (4) An office study of the relations to  
between average heights of dominant trees  
and average heights of dominant  
and codominant trees.
- (5) A western white pine stocking corre-  
lation study.
- (6) A study of immature cedar pole in-  
crement in virgin stands.

PLANS  
F. Y.  
1937:

season of 1935, are made available during 1936,



RESULTS  
OF PAST  
YEAR:

Due to the limited amount of funds available field work was possible on only one of the several studies needed. The western larch-Douglas fir yield study was selected and the final work plan prepared and submitted for approval.

ASSIGN-  
MENT:

During the 1935 field season the following progress was made on the western larch-Douglas fir yield study. Measurements were taken on 142 normal yield plots, 43 of which were referenced and marked so they can be relocated for periodic measurement and study. In addition, 92 sample trees were measured for a volume table check, and approximately 450 sample plots were taken at random in types selected from the forest survey type maps in order to obtain average stocking percentage figures. Sufficient field data have been collected to complete the study. The job of compiling and analyzing the data, preparing the tables, and making the final report will be completed by Cummings before he returns from Washington in May, 1936.

PLANS  
F. Y.  
1937:

Regular Survey funds are only sufficient to pay the salary and expenses of L. J. Cummings. Unless emergency funds are allotted, work on this project will be confined to collection of data or analysis on the part of Cummings alone. If, however, emergency funds equal in amount to those provided the Survey project during the field season of 1935, are made available during 1936,



RE-NEW

it will be possible to complete the larch-Douglas  
fir yield tables during F. Y. 1937.

ASSIGN-  
MENT:

L. J. Cummings and M. Bradner.  
Survey of Forest Resources, Present and Future  
Requirements.

RESEARCH  
PROJECT:

Forest Survey - Depletion Phase.  
Covering the Inland Empire region of the  
Pacific Northwest.

SCOPE:

To determine the average annual rate of  
depletion by cutting, fire, insects, disease, or  
any other factors.

STATUS:

Statistics on the production of forest  
products within the Region have been collected  
currently by the Division of Forest Products of  
this Station for many years. The Region One  
office of Operation and the several Fire Assoc-  
iation offices have likewise kept records for many  
years on the acreage and volume burned over by  
fire within the Inland Empire. The Region One  
office of Forest Management, in cooperation with  
the Forest Insect Field Station at Coeur d'Alene,  
have gathered together general information on  
epidemic insect losses. Prior to last year these  
data had never been corrected, compiled, and  
analyzed to furnish accurate figures on the average  
annual rate of depletion that could be applied to  
the Forest Survey inventory data.



RE-NRM

FINANCIAL  
PROJECT:

Survey of Forest Resources, Present and Future Requirements.

RESEARCH  
PROJECT:

Forest Survey - Depletion Phase.

Covering the Inland Empire region of the Pacific Northwest.

SCOPE:

To determine the average annual rate of depletion by cutting, fire, insects, disease, or any other factors.

STATUS:

Statistics on the production of forest products within the Region have been collected currently by the Division of Forest Products of this Station for many years. The Region One

RESULTS  
OF PAST  
YEAR:

office of Operation and the several Fire Association offices have likewise kept records for many years on the acreage and volume burned over by fire within the Inland Empire. The Region One office of Forest Management, in cooperation with the Forest Insect Field Station at Coeur d'Alene, have gathered together general information on epidemic insect losses. Prior to last year these data had never been corrected, compiled, and analyzed to furnish accurate figures on the average annual rate of depletion that could be applied to the Forest Survey inventory data.

and a report prepared showing the annual pest depletion and regrowth.



During the last half of F. Y. 1935, production figures were compiled to give accurate information on the average annual drain by commercial cutting, separately by counties, for the Inland Empire region. A start was made on obtaining the additional information needed on the amounts of fuel wood, farm fence posts, poles and timbers, local mine timbers, and other minor forest products cut annually. In April 1935, one man was assigned to assist the Forest Insect Field Station staff in making a check survey of the average annual epidemic loss by insects throughout the region. Some preliminary work was done on the fire depletion phase.

RESULTS  
OF PAST  
YEAR:

Additional information on pole, piling, mine timber, and railroad tie production was collected in the field for the entire Inland Empire Region. A detailed study was made of the fence post requirements and the annual depletion of fence post loss material in the region. Information on the sizes of farms and rods of fencing was obtained from The 1,228 loan applications by Montana and Idaho farmers. These figures were augmented by additional records of farm size and rods of fence obtained by personal canvass of 405 Inland Empire farmers. Record was also taken of annual number and species of posts and replacements. The data were compiled and analyzed and a report prepared showing the annual post depletion and requirement.



AN urban fuel survey was made of 13 North Idaho towns, 9 western Montana towns, 15 eastern Montana towns, and Spokane, Washington. From the 405 farms canvassed individual estimates were obtained on the average annual consumption of the various types of fuels. Records of the fuel consumption in C.C.C. camps were also obtained. The final report on the annual depletion by cutting within the Inland Empire Region and eastern Montana, separately by products and counties, will be completed during F. Y. 1936. A crew of two K.O.W. Junior Foresters spent the entire field season of 1935 on an insect loss survey in North Idaho. Plots taken on random sample strips were obtained covering the area from the Salmon River north to the Coeur d'Alene Lake country. It is estimated that sufficient field data were collected to give a reliable insect loss figure by species for the above area which embraces approximately three-quarters of North Idaho. The work of this crew was under the direct supervision of staff members of the Forest Insect Field Station at Coeur d'Alene, Idaho. The work of compiling and analyzing the field data collected during the season was carried on during the winter by one man, who completed the job by the end of February, 1936. E. Marks (K.O.W. Junior Forester), and M. Bradner.



FINANCIAL  
PROJECT:RESEARCH  
PROJECT:

## SCOPE:

During the field season of 1935 the field mapping crews on the inventory phase of the Survey made detailed field inspections of ten recent burns scattered throughout the several major timber types in North Idaho. The data collected will be used to figure the acreage and volume losses by fire, so that the average annual depletion from this source may be determined. This field data supplemented like information collected by the field mapping crews in 1934. In January 1936, an E.C.W. Junior Forester was assigned the job of compiling and analyzing the data already collected. A preliminary report was prepared.

PLANS  
FOR  
F. Y.  
1937:

Unless additional funds are made available, work on the depletion phases (fire, insect, and disease) of the Survey will be limited to an analysis of the data already collected with a view to listing the kind and amount of information that is needed to complete the job. If, on the other hand, emergency funds equal in amount to that provided for use in 1935, are made available in the field season of 1936, most of the needed data can be collected and compiled for completing this phase of the Survey.

ASSIGN-  
MENT:

C. N. Whitney, S. B. Hutchison (E.C.W. Junior Forester), E. Anderson (E.C.W. Junior Forester), E. Marks (E.C.W. Junior Forester), and M. Bradner.



the relation between cubic volume of different classes of  
**FINANCIAL** Survey of Forest Resources. Present and Future  
**PROJECT:** Buildings and the lumber required in their construction  
 Requirements.

have been obtained. In several of the cities sampled,  
**RESEARCH** Forest Survey - Requirements.  
**PROJECT:** Series showing total volume of construction and number

**SCOPE:** living unit To determine the current need for forest  
 vacancy products based on present consumption. To determine  
 were collected the trends in the uses of forest products and the  
 and other underlying causes for such trends. To determine  
 in construction the major opportunities for expansion in outlets  
 Data on for products of our forest lands.

**STATUS:** of nearly Collection of data on volume and type of  
 utilization construction in cities selected as sample plots  
 Statistics has been completed. Seven of the principal cities  
 consumers of the region, including Missoula, Butte, Bozeman,  
 compile Livingston, and Great Falls, Montana; Lewiston,  
 ing the Idaho, and Spokane, Washington, have been covered.  
 ton of In five of these cities detailed card records for  
 Montana each new building or repair permit issued in 1929  
 Federal were made. At Spokane and Butte data needed to  
 of value supplement published records were obtained.  
 have been Building permit records collected in five cities  
 information have been sorted and tabulated by classes of covering  
 4,804 buildings, types of construction, etc., preparatory  
 from the application of conversion factors. Thirty-  
 States three bills of material for use in determining



the relation between cubic volume of different classes of buildings and the lumber required in their construction have been obtained. In several of the cities sampled, summaries showing total volume of construction and number of living units provided annually, 1921-1930 inclusive; vacancy records and timber requirements of city governments were collected. Records showing the consumption of lumber and other forest products used by four county governments in construction by their own forces have been obtained. Data on total mileage of lines and annual timber requirements of nearly all of the principal telephone and electric utilities in Montana and northern Idaho have been collected. Statistics of lumber and miscellaneous timber products consumed by the copper mining industry in Montana have been compiled, and brought up to date. Conversion factors showing the total quantity of wood used in various forms per ton of ore mined by the Anaconda Copper Mining Company in Montana, have been worked up. Data obtained from the Federal Civil Works Administration, Farm Housing Survey, of value in the analysis of rural timber requirements, have been tabulated and summarized. In addition to the information tabulated from the farm home schedules covering 4,804 farms in Montana and 4,465 farms in Idaho, data taken from the "Engineer" schedules for 804 houses in these States have been worked up. Through the use of suitable



RESULTS  
OF PAST  
YEAR:

conversion factors prepared and applied to the quantitative data shown by the Engineer Schedules, the total lumber requirements for repairs and additions to farm houses have been computed for each county in which this kind of sampling was done.

Field work on the rural timber requirements Survey has been completed. The detailed study of farm fence post requirements has been completed. Urban fuel surveys of all the large towns, and most of the smaller ones in the region have been made. Office work on summarization of both the urban and rural requirements for fuelwoods is about 40 percent completed. Computation of the building volumes for all buildings on each farm survey schedule is well underway. Bills of material for use in determining the relation between different classes of farm buildings (other than dwellings) and the lumber required in their construction have been collected. Statistics of lumber, mine props, and other miscellaneous timber products consumed by the principal coal mining districts of Montana have been obtained.



RESULTS  
OF PAST  
YEAR:

Bills of material for urban dwelling construction were tabulated under headings showing framing lumber, siding, finish, doors, windows, and other mill work separately. Conversion factors showing the relation between cubic volume and lumber footage have been computed but before applying them to the city building records, the board foot per cubic foot factors for different types of construction should be rechecked. Some conversion factors for frames, sash, and doors, were worked up and sent to Mr. Hallauer. Figures on total tonnage of ore mined and total forest products used per ton of ore hoisted during the last four years were obtained from one of the largest mining companies in the Coeur d'Alene district of Idaho. Data on timber consumption and tonnage of coal produced by the coal mining companies at Roundup and Red Lodge, Montana, and coal production statistics for other coal producers in the State, to be used as a basis for estimation of total timber requirements by use of conversion factors per ton of ore mined, were obtained. Under the heading of telephone and electric utilities, information on total mileage of lines and annual timber requirements was collected from five additional companies which had not previously reported, namely,



the Mountain States Power Company, operating in Bank Montana and Idaho, the Washington Water Power covering Company, operating in eastern Washington and the data northern Idaho, the Great Northern Utilities station- Company, in Montana, the Flathead Indian Irrigation Service power and telephone lines, port covering operated in Montana, and the Southern Montana Telephone Company. From June to November, in-33, inclusive, urban fuel surveys were made in thirty-asee eight cities and incorporated places of 1,000 man, a population and upward in the region. Of the by, in total number of towns worked, thirteen are in by northern Idaho, nine in western Montana, fifteen in eastern Montana, and one in eastern Washington. 11s Records of the fuel consumption by C.C.C. Camps to of the region were also obtained. Data contained in preliminary reports prepared in the field by a now Hutchison for the fuel studies made in each of these towns are now being summarized. In field trips, aia throughout the region collecting data on urban fuel requirements, records covering farm building setup, wood fuel requirements, rods of fencing, aldential kind of fencing, annual replacements of fence records posts, etc., were obtained by actual field canvass ty of 442 farms. Additional data of this kind were ob-ve tained from about 60 farms in Idaho and Montana by means of a questionnaire. Records as to size of farms and

PLANS  
F.Y.  
1937:



rods of fencing, obtained from the Federal Land Bank at Spokane (farm loan application schedules) covering 1,228 Montana and Idaho farms were combined with data from the field canvass in determining the relationship between the rods of net fence per acre for different sized farms. A preliminary report covering the detailed study of farm fence post requirements has been prepared. During the calendar year 1935, total effective time spent on the requirements phase of the Survey amounted to approximately 9-3/4 man months distributed as follows: 3-3/4 months by Whitney, 3 1/2 months by Hutchison, and 1/2 month by an ECW enrollee who assisted with computing work.

PLANS  
F.Y.  
1937:

Recheck conversion factors obtained from bills of material for urban construction and apply them to the building records for the cities which have been sampled. Tabulate and summarize building volumes now being computed for each farm schedule. After converting building volumes to board feet complete analysis of population figures, vacancy records, etc., and prepare reports showing total lumber requirements for both urban and rural residential and non-residential building construction in the region. Summarize records showing quantities and form of material used by city and county governments for which detailed records have



been obtained. Analyze information furnished by the Montana State Highway Commission on total quantities of lumber and other forest products used on Montana State roadways as shown by contract lettings for the year 1932. Compute volume of lumber required in State Highway construction not shown by State Highway Commission records but reported by contractors in the form of cost figures and covered in Bureau of Census reports "Construction Industry" (Idaho and Montana 1929). At Bureau of Public Roads offices in Missoula obtain records on volume of forest products used in the construction of forest highways and mileage of roads covered in contract lettings not furnished by the Montana State Highway Commission. Collect some road construction data from Idaho State Highway Commission, Boise, Idaho. An effort will be made to obtain this by mail. As a check upon figures available from a market study made some years ago, obtain by correspondence up-to-date timber consumption data for several of the Coeur d'Alene mines. Obtain from Public Utilities Consolidated Corporation, Wallace, Idaho, also from the Interstate Telephone Company, Spokane, the Pacific Telephone and Telegraph Company, Seattle (division office Spokane), and the Home Telephone and Telegraph Company of Spokane, records



covering mileage of lines and timber products used.

After rounding up the information indicated above as lacking, analyze and summarize all records of lumber and timber products used for purposes other than building construction. If the assignment of Junior Forester Hutchison to assist with both the wood

requirements and depletion by cutting studies can be continued throughout the present calendar year, it is estimated that the final reports on these two phases of the Forest Survey can be completed by December 31, 1936.

**ASSIGN-  
MENT:**

M. Bradner, Regional Director; C. N. Whitney  
and S. B. Hutchison.

1. Selective Logging - which has three objectives:  
To determine (1) cost of growing stumpage suitable for sawlogs, ties, mining timber, etc., (2) production costs and market values when the various tree species found in each commercial forest type in the Region are utilized for lumber and other commodities. Final results to show from a regional standpoint, or for an individual holding, cutting limits (by tree d.b.h. and area) and utilization standards necessary to provide a reasonable profit for the operator when practicing varying degrees of silviculture.

2. To make available to lumbermen, foresters, and other interested agencies, information secured incidental to the main project, such as overrun data, efficiency comparisons



RP-NRM

FINANCIAL  
PROJECT:

WORK  
PROJECT:

RESEARCH  
PROJECT:

SCOPE:

STATUS: 1.

of various types of logging and milling equipment, etc.

c. To make available to the same agencies, data

Forest Products Investigations. promotion of

Production Costs and Utilization Investigations.

Logging output studies designed to measure the

Logging and Milling. upon good forestry practices

of new logging equipment, new logging methods, and

various methods of log transportation. This project provides information on two important phases of logging and milling. They are:

1. Selective logging studies have been undertaken in

the western white pine type, the ponderosa pine

type, and the larch-Douglas fir type. Information is

now available on economic tree and log grades for

ponderosa pine, also on the minimum-sized profitable

tree in (1) the ponderosa pine type (2) the western

white pine type and (3) the larch-Douglas fir type

are utilized for lumber and other commodities.

Final results to show from a regional stand-

point, or for an individual holding, cutting

limits (by tree d.b.h. and area) and utili-

zation standards necessary to provide a

reasonable profit for the operator when

practicing varying degrees of silviculture.

b. To make available to lumbermen, foresters,

Deer and other interested agencies, information

secured incidental to the main project,

such as overrun data, efficiency comparisons



of various types of logging and milling equipment, etc.

c. To make available to the same agencies, data fundamentally useful in the promotion of

industrial forestry.

2. Logging output studies designed to measure the efficiency and effect upon good forestry practice of new logging equipment, new logging methods, and various methods of log transportation.

STATUS: 1. Selective logging studies have been undertaken in the western white pine type, the ponderosa pine type, and the larch-Douglas fir type. Information is now available on economic tree and log grades for ponderosa pine, also on the minimum-sized profitable tree in (1) the ponderosa pine type, (2) the western white pine type, and (3) the larch-Douglas fir type for several methods of cutting.

Studies and their status are listed below by timber types.

Study	Field Work	Office Compilation	Results made Available
a. <u>Ponderosa pine type</u>			
Heron Lumber Co.	Complete	Complete	Yes
Harper Lumber Co.	"	"	"
J. Neils Lumber Co.	"	"	"
A.C.M. Relogging	"	"	"
A.C.M. 1932	"	"	"
Deer Park Lumber Co. Started in cooperation with Code Engineers of the Western Pine Association but abandoned upon cessation of Lumber Code.			

and basic utilization data were made available.



b. Western white pine type

Region wide 1925

mill scale

Complete

Complete

Yes

Ohio Match Co.

White Pine Lbr. Co.

1/2 complete

1/5 complete

No

c. Larch-Douglas fir type

Kinshella Tie Mills

Complete

7/8 complete

Partly

2. Results of logging output studies, including principal phases of logging in the major commercial forest types, published in 1933 and in 1934 data made available on practically every phase of current logging practice in the ponderosa pine type. A short study of truck logging in the Region was inaugurated and completed during the year. Results were used in determining standards for Forest utilization roads.

1. a. About one-fourth of the field work for the White Pine Lumber Company logging and milling study was completed. Both field and office work for the felling and bucking, loading and skidding studies made in connection with this project were completed and are ready for use in production cost computation or presentation to interested parties.

- b. Assistance was rendered Region Three of the Forest Service in a logging and milling study at McNary, Arizona. A study plan was prepared and the field study and office compilation organized and supervised. Preliminary results on overrun and basic utilization data were made available.

PLANS  
F. Y.  
1937:

RESULTS  
OF PAST  
YEAR:

ASSIGN-  
MENT:



RP-NRM

2. a. Motor truck log hauling study completed for Forest Service Regional Logging Engineer.

FINANCIAL  
PROJECT:

b. Preliminary transportation plan consisting of written report and 4 and 8-inch scale

WORK  
PROJECT:

topographic road maps prepared for Experimental Forests now under administration. Plan

RESEARCH  
PROJECT:

includes largely utilization roads designed

PLANS

SCOPE:

to facilitate direct skidding to motor trucks, and eliminate chutes and ground skidding at excessive distances.

ASSIGN-  
MENT:

PLANS  
F. Y.  
1937:

1. Complete all phases of the White Pine Lumber Company project in the western white pine type.

2. Bring final transportation plans for Experimental Forests to 60 percent<sup>state</sup> of completion.

3. Complete scientific report and publish results of Kinsella Tie Mills project.

4. Apply accumulated results of selective logging studies to operation of Anaconda Copper Mining

STATUS:

a. Western Larch: Bulletin 3895 published 1932.

b. White Pine: Bulletin 3403 published February 1934.

c. Lodgepole Pine:

Anderson and Kapraeger.

ASSIGN-  
MENT:

All available data have been assembled but preparation for publication of bulletin has been deferred pending completion of work on other projects of more urgent nature. Present economic conditions in the lumber and timber products



RP-NRM

industries have tended to place the widespread utilization and sale of lodgepole pine further

FINANCIAL  
PROJECT:

Forest Products Investigations. for information

WORK  
PROJECT:

on utilization of this species has been minimized.  
Production costs and Utilization Investigations.

OF EAST  
RESEARCH  
PROJECT:

No work was done.  
Species Utilization for Western Larch, White Fir,  
and Lodgepole Pine.

PLANS

SCOPE:

a. To prepare or assist in preparing bulletins to

ASSIGN-  
MENT:

Lodgepole Pine Bulletin - Summary.  
furnish detailed information on the properties

and characteristics of the wood of several of  
the Region's little-used species (western  
larch, white fir and lodgepole), which will  
assist consumers in determining the suit-  
ability of the species for specific uses.

Generally it is intended to promote the good  
utilization of such species, thereby increas-  
ing the economic value of this source of our  
present timber supply.

STATUS:

- a. Western Larch - Bulletin #285 published 1932.
- b. White Fir: Bulletin #408 published February,  
1934.

c. Lodgepole Pine:

All available data have been assembled but prep-  
aration for publication of bulletin has been  
deferred pending completion of work on other  
projects of more urgent nature. Present economic  
conditions in the lumber and timber products



RP-NRM

FINANCIAL  
PROJECT:

WORK

RESULTS  
OF PAST  
YEAR:

PLANS  
F. Y.  
1937:

ASSIGN-  
MENT:

industries have tended to place the widespread utilization and sale of lodgepole pine further into the future. Thus the need for information on utilization of this species has been minimized.

No work was done.

Woods and Mill Utilization.

No work contemplated, but the project will be from carried on the active list.

Lodgepole Pine Bulletin - Whitney.

following:

a. Overrun data and efficiency comparisons of logging and milling equipment.

b. Waste investigations designed to inventory and eliminate wood waste in lumbering.

c. Depreciation studies designed to measure volume and value losses caused by agencies such as fire, fungus stain, insects and physical injury during the process of manufacture.

d. A determination of the practical value of log grades versus tree grades for the principal lumber producing species of the Region.

STATUS:

a. The results of overrun and sawmill efficiency studies have been presented to the lumber industry of the Inland Empire.



RP-NRM

FINANCIAL  
PROJECT:

WORK  
PROJECT:

RESEARCH  
PROJECT:

SCOPE:

b. Residual wood after logging has been inventoried in the western white pine, ponderosa pine, larch-Douglas fir, and lodgepole pine

Production Costs and Utilization Investigations.

the western white pine, ponderosa pine, and larch-Douglas fir types has been studied in

Woods and Mill Utilization.

and This project will furnish information from

time to time pertaining to utilization in the saw-

c. mill and the woods, with special reference to the following:

a. Overrun data and efficiency comparisons of logging and milling equipment. have been

b. Waste investigations designed to inventory and eliminate wood waste in lumbering.

a. c. Depreciation studies designed to measure volume and value losses caused by agencies such as fire, fungus stain, insects and physical injury during the process of manufacture.

d. A determination of the practical value of log grades versus tree grades for the principal lumber producing species of the Region.

STATUS:

a. The results of overrun and sawmill efficiency studies have been presented to the lumber industry of the Inland Empire.

RESULTS  
OF PAST  
YEAR:

PLANS  
F. Y.  
1937:

ASSIGN-  
MENT:



FINANCIAL  
PROJECT:

WORK  
PROJECT:

RESEARCH  
PROJECT:

SCOPE:

b. Residual wood after logging has been inventoried in the western white pine, ponderosa pine, larch-Douglas fir, and lodgepole pine types. Breakage loss in felling timber in the western white pine, ponderosa pine, and larch-Douglas fir types has been studied and results prepared for circulation to loggers and lumbermen.

c. The results of comprehensive studies of fire damage, depreciation in river-driven white pine logs and depreciation in white pine logs transported over gravity chutes, have been published and distributed to the northwestern lumber industry.

RESULTS  
OF PAST  
YEAR:

a. Project inactive during past year.

PLANS  
F. Y.  
1937:

No work planned, but project will be carried on active list.

ASSIGN-  
MENT:

Anderson and Rapraeger.

PLANS  
F. Y.  
1937

STATUS:

Activity 1. This work is handled each year for the states of Idaho and Montana in cooperation with the Bureau of Census. On the average 800 concerns are canvassed, some of which require



personal solicitation. It is planned to continue

**FINANCIAL PROJECT:**

Forest Products Investigations.

**WORK PROJECT:**

Activity 2. Annual wholesale lumber prices are now available dating back to 1920. Statistics of Production, Consumption, and Distribution of Forest Products.

**RESEARCH PROJECT:**

Statistics. (Includes Annual Lumber Census, Price and Lumbering Costs.)

**SCOPE:**

are also available back to 1920. Stumpage prices

The scope of this project is three-fold:

Activity 1. A canvass of all the sawmills and producers of miscellaneous timber products to

obtain the production of lumber, lath, shingles and miscellaneous timber products.

Activity 2. Collection of lumber and timber products price statistics for northern Idaho,

principally western white pine and yellow pine, eastern Washington and western Montana, in sufficient volume to indicate periodic trends in the

selling price of lumber (wholesale and retail) stumpage, logs, cedar products, and ties.

Activity 3. Collection of detailed logging and manufacturing costs from the larger lumber companies in northern Idaho, eastern Washington,

and western Montana, by personal contact.

Continuation of all activities in project.

Activity 1. This work is handled each year for

the states of Idaho and Montana in cooperation with the Bureau of Census. On the average 800 concerns are canvassed, some of which require

flexible prices.

-142-

-142-



RP-HUM

RESULTS  
OF PAST  
YEAR  
FINANCIAL  
PROJECT:

WORK  
PROJECT:

RESEARCH  
PROJECT:

SCOPE:

personal solicitation. It is planned to continue this cooperative project indefinitely.

Activity 2. Annual wholesale lumber prices are now available dating back to 1912. Retail prices on lumber are available dating back to 1920.

Wholesale prices on logs, ties, and cedar products are also available back to 1920. Stumpage prices have been recorded annually since 1912 and are furnished currently to interested agencies.

Activity 3. Detailed average lumber production costs are now available back to 1916. At present these costs are segregated for operators producing

(1) 50 percent or more western white pine, (2)

principally western white pine and ponderosa pine,

(3) 50 percent or more ponderosa pine, (4) 50 percent

or more larch and Douglas fir and, (5) principally

ties, timbers, and match plank.

Collected and compiled statistics on all

the activities outlined above last year as in the

past, are obtained from inspections made by Forest

Supervisor.

Continuation of all activities in project.

Records obtained for poles specifically designated

as experimental to Activity 1; Rapraeger and

Bouchard to Activity 2; Anderson and Neff (Regional

Logging Engineer) to Activity 3. on approximately

35,000 treated and untreated power line and electri-

fication poles.

RESULTS  
OF PAST  
YEAR:

PLANS  
F. Y.  
1937

ASSIGN-  
MENT:



RP-NRM

**RESULTS**

**OF PAST YEAR:**

**YEAR:**

**FINANCIAL**

**PROJECT:**

**WORK**

**PROJECT:**

**RESEARCH**

**PROJECT:**

**SCOPE:**

**PLANS**

**P. Y.**

**1937:**

**STATUS:**

Seven inspections of experimental timbers were made as scheduled for the year. In addition, Forest Products Investigations.

the Dillon-Rattlesnake Creek telephone line which investigations of wood treatments, coatings, poles, paints, glues, and laminated construction.

Wood Preservation. Some publicity

based on the results from tests of poles in this line and treated lodgepole pine stubs in the Choteau-untreated local woods in actual service and the efficiency of various preservatives, including a regional press release.

results of treatments by different processes, and to disseminate such information. This work is done in cooperation with the Forest Products Laboratory.

The project now includes about 20 installations distributed widely throughout the region. During the year, considerable data accumulated from wood-preserving studies in connection with. More than 20,000 test timbers consisting of full-service tests were contributed to various branches of the Forest Service and to other agencies. The poles, pole stubs, fence posts and mining timbers following examples indicate how such information is being applied. Data on a few of these installations are obtained from inspections made by Forest Supervisors. In addition to the detailed service records obtained for poles specifically designated as experimental timbers, the Montana Power Company U. S. Biological Survey by inspecting new 13-foot and the C.M.St.P. & P. Railroad Company furnish stubbing and replacement records on approximately 33,000 treated and untreated power line and electrification poles. Extension Agent Outbank, Montana, by furnishing information requested by a timber operator in Glacier



RESULTS  
OF PAST  
YEAR:

County engaged in the commercial production of Douglas fir posts, (4) Office of Indian Affairs, Billings, Montana, by furnishing information about preservative treatments applicable to range improvement timbers, and includes about 200 creosoted lodgepole pine poles (5) Regional Procurement and Supply Division, the treated by rangers of the Beaverhead National Forest Remount Station Staff, and with the Lolo and St. Joe Forests, on problems arising in the purchase and use of wood preservatives.

PLANS  
F. Y. 1937:

line and treated lodgepole pine stubs in the Choteau-Ear Mountain telephone line was obtained by means of of the following installations:  
a regional press release.

Project L-50 - Northern Pacific test track ties,  
An inspection report on arsenic treated poles

Project L-50 - Augusta distribution system of the Montana  
Missoula, Montana.

Power Company was obtained from the operating engineer  
Project L-214 - Mt. Henry telephone line, arsenic-  
of that company. western larch poles,  
Lolo Forest, Montana.

During the year, considerable data accumulated  
Project L-214 - Browne-Flathead telephone line,  
from wood-preserving studies in connection with  
Montana.

service tests were contributed to various branches  
Project L-214 - Lower Gallatin District No. 2,  
of the Forest Service and to other agencies. The  
Gallatin Forest, Montana.

following examples indicate how such information is  
Project L-214 - Squaw Creek Ranger Station fence,  
being applied: Cooperated with (1) Region Two by  
petroleum mixture, Gallatin Forest,  
supplying basic information for treating specifi-

Project L-214 - Application to treatment of Douglas fir  
Montana, posts treated by steeping  
fence posts with creosote-petroleum mixtures, (2)  
arsenic, cooperation with U. S.  
U. S. Biological Survey by inspecting new 13-foot

Project L-214 - butt creosoted western red cedar posts purchased for  
arsenic-treated posts, Deerlodge  
use in National Bison Range fence lines, (3) County  
Extension Agent Cutbank, Montana, by furnishing in-  
formation requested by a timber operator in Glacier



County engaged in the commercial production of Douglas fir posts, (4) Office of Indian Affairs, Billings, Montana, by furnishing information about preservative treatments applicable to range improvement timbers, and (5) Regional Procurement and Supply Division, the Remount Station Staff, and with the Lolo and St. Joe Forests, on problems arising in the purchase and use of wood preservatives.

PLANS: Make inspections and prepare reports on each  
F. Y. of the following installations:  
1937:

Project L-50 - Northern Pacific test track ties,  
Thompson Falls, Montana.

Project L-214 - Northern Pacific test track ties,  
Missoula, Montana.

Project L-214 - Mt. Henry telephone line, arsenic-  
treated western larch poles,  
Lolo Forest, Montana.

Project L-214 - Bozeman-Flathead telephone line,  
arsenic-treated stubs, Gallatin Forest,  
Montana.

Project L-214 - Lower Gallatin District No. 2,  
creosoted lodgepole pine stubs,  
Gallatin Forest, Montana.

Project L-214 - Squaw Creek Ranger Station fence,  
posts treated with tetrachlorophenol-  
petroleum mixture, Gallatin Forest,  
Montana.

Project L-214 - Experimental fences Miles City,  
Montana, posts treated by steeping  
creosote-petroleum mixtures and  
arsenic, cooperation with U. S.  
Range Livestock Experiment Station.

Project L-214 - Sunnyside Ranger Station fence,  
arsenic-treated posts, Deerlodge  
Forest, Montana.



Designate a few hundred split cottonwood posts treated with mixtures of coal tar and spent crank case oil at J. H. Ray ranch near Missoula for periodic inspection. While preliminary data were obtained for these posts, treated at a total cost of only 3 cents each in 1934, the initial inspection scheduled for 1935 was not made.

**ASSIGN-  
MENT:**

- (a) Whitney. of Region One fire reports.
- (b) Detection facilities and methods, location of stations.
- (c) Initial attack on fires. Placement of men, speed and strength of attack by fuel types.
- (d) Reinforcement. Speed and strength requirements by fuel types. Roads and trails needed.
- (e) Preparation of plans by forests so that standards of protection will be achieved equitably.
- (f) Use of chemicals in fire control.

**STATUS:**

- (a) Completed for 1931-1932. In prospect for 1931-1933.
- (b) Completed and results already in routine use, except for (1) perfection and test of two forms of visibility meter, and (2) a study of stationary versus moving detectors.
- (c&d) Completed and results in use. More detailed description and standardization of fuel types believed to be desirable.



RS-NRM

FINANCIAL  
PROJECT:

WORK  
PROJECT:

RESEARCH  
PROJECT:

SCOPE:

Forest Management Investigations.

Fire Protection Investigations.

Pr-1 Attack - Fire control planning.

(a) Analysis of Region One fire reports.

(b) Detection facilities and methods, location of stations.

(c) Initial attack on fires. Placement of men, speed and strength of attack by fuel types.

RESULTS:

(d) Reinforcement. Speed and strength requirements by fuel types. Roads and trails needed.

(e) Preparation of plans by Forests so that standards of protection will be achieved equitably.

(f) Use of chemicals in fire control.

STATUS:

(a) Completed for 1921-1930. In prospect for 1931-1935.

(b) Completed and results already in routine use, except for (1) perfection and test of two forms of visibility meter, and (2) a study of stationary versus moving detectors.

(c&d) Completed and results in use. More detailed

(f) description and standardization of fuel types

believed to be desirable.

more extensive tests.



PLANS:  
F.Y.  
1937

(a-e) Analysis of fire reports for 1931-1935  
(e) Completed and many of the results in  
should be made in 1938 to determine recent  
actual use in Region One. Methods not  
progress and the benefits of action taken  
yet published.

WORK  
PROJECT:  
RESEARCH  
PROJECT:  
SCOPE:

(a-e) Regional Office now has one man working  
incl.) on nearly all these features, modifying  
some of the research conclusions and  
recommendations, and getting field  
application.

(f) Some work done in 1929 with solutions  
of metallic salts. Results not promising.  
A few tests of frothy mixtures made in  
1935 were much more promising.

RESULTS:

(a-e) The facts assembled and the method evolved  
were put to use as fast as the project  
progressed. The Regional Office is now  
engaged in getting full application on  
the ten fire forests comprising some 17  
million acres. One form of visibility  
meter was tested, insufficiently, on four  
lookouts during 1935. Some minor improve-  
ments were indicated as possible. A 400-  
page manuscript report describing all the  
steps of fire control planning has been  
reviewed and edited and is now in process  
of final revision by Hornby.

ASSIGN-  
MENT:

(f) The quick action and protracted beneficial  
effects of frothy mixtures warrant much  
more extensive tests.



PLANS: (a-e) Analysis of fire reports for 1931-1935  
 F.Y. should be made in 1936 to determine recent  
 1937 progress and the benefits of action taken  
 FINANCIAL: Forest Management Investigations.  
 PROJECT: Fire in 1934 and 1935 on basis of fire control  
 WORK: planning. Refinements in methods of planning  
 PROJECT: Pt-2 Behavior - Measuring the daily and seasonal  
 RESEARCH: and changes in the interpretation of facts  
 PROJECT: variables of fire danger.  
 SCOPE: should be expected. Present manuscript  
 1. Cooperation with Weather Bureau in fire-  
 report should be published as soon as  
 weather forecasting.  
 possible. An associate or full-grade  
 2. Lightning as a cause of forest fires.  
 forester should be selected to fill the  
 3. (a) Developing methods of measuring fuel  
 moisture.  
 other research work.  
 (b) Determining the effects of each of the  
 (f) The Washington Office of Fire Control has  
 weather elements on fuel moisture.  
 suggested that "the responsibility for  
 (c) Correlating fuel moisture with inflama-  
 frothy mixture work be allocated to  
 ability and fire behavior.  
 Gisborne."  
 (d) Determining effect of condition of green  
 H. T. Gisborne with the assistance of one  
 vegetation on rate of spread of fire.  
 man yet to be selected. This man to take  
 (e) Determining differences in fire danger  
 over phases (a) to (c) as rapidly as  
 factors according to amount of shade,  
 possible.  
 elevation, and north vs. south slopes.  
 (f) Integrating all factors of fire danger.  
 4. Supplying instruments and supervising the  
 operation of all stations using the Northern  
 Rocky Mountain methods of measuring forest fire  
 danger.

ASSIGN-  
 MENT:



R-NRM

FINANCIAL  
PROJECT:

Forest Management Investigations.

WORK  
PROJECT:

Fire Protection Investigations.

RESEARCH  
PROJECT:

Pr-2 Behavior - Measuring the daily and seasonal variables of fire danger.

SCOPE:

1. Cooperation with Weather Bureau in fire-weather forecasting.

2. (a) Lightning as a cause of forest fires.

3. (a) Developing methods of measuring fuel moisture.

(b) Determining the effects of each of the

(d) weather elements on fuel moisture.

(c) Correlating fuel moisture with inflammability and fire behavior.

(d) Determining effect of condition of green vegetation on rate of spread of fire.

(e) Determining differences in fire danger factors according to amount of shade,

(e) elevation, and north vs. south slopes.

(f) Integrating all factors of fire danger.

4. Supplying instruments and supervising the operation of all stations using the Northern

Rocky Mountain methods of measuring forest fire

danger.

made and calibrated, bringing total to 200. Working

on eight forests inspected.



STATUS: 1. Continued and greatly improved by the Weather Bureau by establishment of an official weather station at Missoula. "A Ten-Year Record of Lightning

2. The determination of number of lightning storms days by Forests is being continued. Arrangements completed with General Electric Company for some preliminary tests of Thyrite insulators on phone lines. No new experimental results.

3. (a) Continued tests of present methods.  
(b) One season's data added to records for later analysis.  
(c) No work done in 1935.  
(d) Jenison and several helpers, including a chemist, gave full time to this phase in 1935, at some sacrifice to other phases of the project. Jenison used this phase as a subject for his Master's thesis under a Pack Fellowship at Yale. Thesis completed and ready for University publication.  
(e) Hayes gave his full time to this phase and obtained the most complete and accurate records so far made. Analysis under way.  
(f) Use of Fire Danger Meter continued on the fire forests. Differences between north and

4. Forty new Northern Rocky Mountain wind gages made and calibrated, bringing total to 200. Work on eight Forests inspected.



without specifying the exposure. These conditions

**RESULTS:** 1. Fire-weather forecasts for 1935 rated by field men as the most accurate ever furnished.

2. Report entitled "A Ten-Year Record of Lightning Storms and Forest Fires" in course of preparation.

3. (a) Season's tests showed present methods a guide to fire control action on ten forests dependable.

(b) No new results.

(c) No new experimental results.

Continue all phases at present status, except field use of fuel moisture measurements the lightning study which with the publication of a final report will be completed. Install a few

(d) Several visual characteristics of plants

indicated later seasonal development of

fire danger in 1935 than in 1934, and this was verified by actual behavior of fires.

Chemical analyses indicate that the chemical constituents of plants studied do not change enough to change fire behavior.

(e) Data for 1935 agree with indications obtained in 1934, that fire danger factors are most

unfavorable (1) in daytime at low elevations, and operate the four major weather and humidity

(2) at night at high altitudes, and (3) most consistently sustained in the intermediate

zone between the valley bottoms and the

mountain tops. Differences between north and

south slopes are so great, however, that

danger should not be specified altitudinally



without specifying the exposure. These conditions

affect both the proper sampling of a Forest to

measure fire danger, and the most efficient distri-

bution of men and fire control facilities.

(f) Fire Danger Meter method found so satisfactory as

a guide to fire control action on ten Forests

that Regional Forester has requested use of this

method on other nine Forests in Region One.

Continue all phases at present status, except

the lightning study which with the publication of a

final report will be completed. Install a few

Thyrite insulators, provide record forms for

protected and check lines.

H. T. Osborne, assisted by (1) G. M.

Jemison, who will give most of his time to the

study of effect of green vegetation on rate of

spread of fire, (2) G. L. Hayes, who will

concentrate largely on the fuel hygograph

operation and records, and (3) one other, who

will calibrate duff hygrometers and wood cylinders

and operate the four major weather and inflamma-

bility stations at Priest River.

the summer of 1934 when extreme drought conditions

necessitated the use of hay to supplement the

range feed beginning on July 20, September 5, and

September 14 for the cows on overgrazed, moderate-

ly grazed and light-grazed ranges, respectively.

Range forage was completely exhausted in November

FINANCIAL  
PROJECT:

WORK  
PROJECT:

RESEARCH  
PROJECT:

SCOPE:

PLANS  
F.Y.  
1937:

ASSIGN-  
MENT:

STATUS:



## STATUS SHEET

### FINANCIAL PROJECT:

1934 and all cows were removed to the feed lot instead of remaining on the range as they had done the previous two winters. In April 1935 the

### WORK PROJECT:

Grazing Management Investigations but hay feed-

### RESEARCH PROJECT:

ing had to be continued until April 28 for the Management Short Grass Ranges (Cattle & Sheep moderately and lightly grazed lots and until May phases).

### SCOPE:

To determine the correct utilization practiced hay again from October 5 to October 30 but the other two lots did not require this special Montana from the standpoint of vegetation and soil feed. October 30 when all cows were removed to requirements but with full recognition of the winter pastures, is considered as the end of the economics of livestock production. The work for third yearly period. At that time the cows on the past 3 years has been on cattle range but is overgrazed ranges averaged 54 pounds lighter than to be expanded to include sheep range in 1936. the average for the other two lots. Weights and

### STATUS:

In July 1932 at the U. S. Range Livestock Experiment Station (Old Fort Keogh) 60 cows were results.

segregated into 3 uniform lots and started on The number of chart quadrats in various replicated utilization tests on 12 fenced range pastures was increased by 15 in 1935 making a pastures aggregating 1,867 acres. Each of these total of 74 quadrat samples to follow the behavior three lots had the same care and treatment except of the vegetation on these pastures under varying for the varying allowance of range forage up until intensities of use. Three series of circular the summer of 1934 when extreme drought conditions foot estimate plots were laid out in Pasture C necessitated the use of hay to supplement the during the past year. The number of plant development stations and clipping plots were also increased September 14 for the cows on overgrazed, moderate- and certain changes in procedure were started to ly grazed and lightly grazed ranges, respectively. strengthen the data on vegetation. Range forage was completely exhausted in November



Ten new quadrats were established and 1934 and all cows were removed to the feed lot charted to supplement transect in the sagebrush eradication plot on Tongue River. In April 1935 the

A detailed grazing survey was made on cows were returned to their pastures but hay feeding had to be continued until April 23 for the about 4,500 acres located on Custer Flat that is to be used for a sheep grazing phase of the short grass range project. A centrally located well 9 for the overgrazed lot. The latter had to be was drilled and equipped with a windmill. Fencing of the area was carried on until severe weather in December required abandonment of the the other two lots did not require this special feed. October 30, when all cows were removed to winter pastures, is considered as the end of the third yearly period. At that time the cows on

#### RESULTS:

In the interest of brevity and completeness overgrazed ranges averaged 54 pounds lighter than results will be summarized for three years of this the average for the other two lots. Weights and experiment rather than for the past year alone. other data on calf production will be given under Heavy mortality of important forage species results.

that became evident during the 1934 drought was The number of chart quadrats in various even more striking when the quadrats were charted pastures was increased by 13 in 1935 making a in 1935. The following tabulation shows the total of 74 quadrat samples to follow the behavior of the vegetation on these pastures under varying intensities of use. Three series of circular foot estimate plots were laid out in Pasture C

during the past year. The number of plant development stations and clipping plats were also increased and certain changes in procedure were started to strengthen the data on vegetation.



Table 1. -- Areas of charted vegetation on 57 water sources quadrats.

Ten new quadrats were established and charted to supplement transect in the sagebrush eradication plot on Tongue River.

A detailed grazing survey was made on about 4,500 acres located on Custer Flat that is to be used for a sheep grazing phase of the short grass range project. A centrally located well was drilled and equipped with a windmill. Fencing of the area was carried on until severe weather in December required abandonment of the ERA crew. This work will be resumed in March if ERA men are available.

**RESULTS:** In the interest of brevity and completeness results will be summarized for three years of this experiment rather than for the past year alone.

Heavy mortality of important forage species that became evident during the 1934 drought was even more striking when the quadrats were charted in 1935. The following tabulation shows the extent of the reduced density on 57 quadrats in 1935 as compared to 1933, and the lack of correlation with the degree of grazing.

for the fact that the quadrats were charted in 1935 during the drought. The following tabulation shows the extent of the reduced density on 57 quadrats in 1935 as compared to 1933, and the lack of correlation with the degree of grazing.

of density on 57 quadrats in 1935 as compared to 1933, and the lack of correlation with the degree of grazing.

the same degree. These data fail to show significant differences in the decline based on intensity of grazing since 1933.



Table 1.—Area of charted vegetation on 57 meter square quadrats.

Species	Total Area *			Percent change between 1933 & 1935, based on degree of use			
	Cm <sup>2</sup> 1933	Cm <sup>2</sup> 1935	%	Change	Over- Grazed	Moderately grazed	Lightly grazed
<u>Bouteloua gracilis</u>	85,325	21,399	-75	-74	-75	-75	-76
<u>Buchloe dactyloides</u>	43,752	10,242	-79	-81	-83	-83	-56
<u>Agropyron smithii</u>	11,634	2,947	-74	-68	-86	-86	-75
<u>Carex filifolia</u>	2,719	2,398	-12	-2	-26	-26	-60
<u>Stipa comata</u>	2,999	955	-59	-44	-75	-75	-63
<u>Poa secunda</u>	2,446	6,700	+174	+190	+153	+153	+179
Others	11,890	2,595	-78	-78	-70	-70	-83
Total all species	164,853	47,130	-71	-70	-75	-75	-68

\* In order to facilitate comparisons, an arbitrary area is assigned to seedlings and small individuals that were charted as spots.

No entirely satisfactory explanation can be offered for the fact that Poa secunda nearly trebled its density during the drought when all other important species declined from 12 to 79 percent with a total of 71 percent, all species included. Cactus increased its area also on several quadrats but not significantly or consistently. Because of some compensating factors this 71 percent loss of density did not reduce total forage production to quite the same degree. These data fail to show significant differences in the decline based on intensity of grazing since 1933



so that drought must to date be considered as the controlling factor. This confirms the impression that short grass ranges are very resistant to overgrazing but yields evidence of surprising penalties caused by an unusually severe drought.

The 1935 weaning weight of calves from the three lots was 313.8, 372.0 and 361.7 pounds, respectively, for those on overgrazed, moderately grazed and lightly grazed ranges in approximately the same relative position as in the two preceding years. A remarkably close relationship between cost of feed for producing range calves and a somewhat similar relation between calf crop and birth weight is shown by the following tabular data for the 3 years of the test.

Feed cost per calf lb., costs	5.82	5.81	6.18
Comp. cost with Lot 2 as 100%	153.35	100.0	114.85

\* Total weaning weight produced to 20 cows.

The increase of more than 50 percent in cost of feed for the production on overgrazed range before the effects of such use on the vegetation can be clearly demonstrated is of profound significance. Even if this difference were accentuated by drought no account was taken of inferior grade of -159- developed calves or of more rapid depreciation of cows on overgrazed ranges.



Table 2.—Effects of overgrazing on calf production.

Summary, 3 years	20 cows Lot 1 overgrazed		20 cows Lot 2 moderately grazed		20 cows Lot 3 lightly grazed	
	Amount	Cost	Amount	Cost	Amount	Cost
Range acres	1386		1830		2328	
Range costs @ 10¢ per acre		138.60		183.00		232.80
Hay, tons	64.02		53.22		49.03	
Hay, cost @ \$3.00		612.16		425.76		392.25
Totals, 3 years		650.76		608.76		625.03
Calf crop (number)	(42)		(52)		(46)	
(percent)	70%		86.7%		76.7%	
Ave. birth wt. %	67.0		73.2		70.3	
Ave. weaning wt.	277.9		321.3		326.3	
Ave. wt. per cow *	194.5		278.4		350.1	
Total weaning wt.	11670		16706		15010	
Feed cost per calf lb., cents		5.58		5.64		4.16
Comp. cost with Lot 2 as 100%		153.3%		100.0%		114.3%

\* Total weaning weight prorated to 20 cows.

The increase of more than 50 percent in cost of feed for the production on overgrazed range before the effects of such use on the vegetation can be clearly demonstrated is of profound significance. Even if this difference were accentuated by drought no account was taken of inferior grade of poorly developed calves or of more rapid depreciation of cows on overgrazed ranges.



Aside from relative cost of production, started and pushed as far as resources will permit the following inferences may be drawn from the foregoing data.

1. Prudence demands that drought effects be fully considered before financial commitments are made to restock overgrazed ranges from which heavy forced shipments of livestock were made in 1931 and again in 1934, not to mention previous times.

2. If from 30.5 to 38.8 acres of better than average short grass range is required per cow in producing a calf to weaning age it will require use, though not necessarily ownership, of at least 10 sections of such land to support a family unit of 150 breeding cows operating on a yearling basis. Only a low density of population can be supported on such a basis.

The cattle phase of this project will be continued without major changes. Plans for improvements needed on the sheep phase of this project will be pushed forward as indicated above. A band of 240 lambs from the 1935 crop were segregated last fall and will be started on a utilization and management test on 5 pastures arranged in series as soon as fences are completed, possibly in May. A set-up of vegetative plots will be



**FINANCIAL  
PROJECT:**

started and pushed as far as resources will permit during the coming season.

**WORK  
PROJECT:**

Special efforts will be made to develop

**RESEARCH  
PROJECT:**

methods that will yield more satisfactory vegetative records and measurements than are provided

**SCOPE:**

by the quadrat method. Serious shortcomings have been found from the standpoint of both time required and reliability of the quadrat method for use in the short grass type of vegetation. Based on certain leads developed last year, a status

**STATUS:**

sheet for a subproject on methods of study for range vegetation is attached. A working plan is being prepared to assist in exploring this field in a more systematic manner. It is hoped that results may be of value in sampling the vegetation on both the cattle and sheep phases of this project. Quadrats will be established in any case on the sheep range.

**ASSIGN-  
MENT:**

Leon C. Hurtt, Lincoln Ellison and E. J. Woolfolk in cooperation with the Bureau of Animal Industry at the U.S. Range Livestock Experiment

**RESULTS:**

Station, Miles City, Montana.

**PLANS FOR  
F.Y. 1937:**

Fencing of the outside areas of the cattle portion of the range and other preliminary improvement will be done in 1936. An intensive range survey will be made of the area as a basis for future



**FINANCIAL  
PROJECT:**

Range Investigations

**WORK  
PROJECT:**

Grazing Management Investigations

**RESEARCH  
PROJECT:**

Management Summer Ranges

**SCOPE:**

To determine the correct time and intensity of use for mountain cattle and sheep ranges from the standpoint of the vegetation and the soil requirements and with recognition of the economics of range livestock production.

**STATUS:**

New. An area of approximately 7,500 acres located east of the Ruby River on the Beaverhead National Forest was selected and in July 1935 was designated by Chief Forester Silcox as the Vigilante Experimental Range. A topographic map with a 50-foot contour interval was made in the fall of 1935 by Mr. Shields of the Regional Office of Engineering. An ERA crew started to cut posts and poles for fencing the area which work is to be continued when spring weather conditions will permit.

**RESULTS:**

Above preliminary mapping and improvement only.

**PLANS FOR  
F.Y. 1937:**

Fencing of the outside areas of the cattle portion of the range and other preliminary improvement will be done in 1938. An intensive range survey will be made of the area as a basis for future



FINANCIAL  
PROJECT:

WORK  
PROJECT:

RESEARCH  
PROJECT:

SCOPE:

STATUS:

ASSIGN-  
MENT:

RESULTS OF  
PAST YEAR:

experimental work. After careful study of the area a plan of procedure will be mapped out and a tentative working plan will be prepared with the idea of measuring the behavior of the vegetation under total protection and under 3 intensities of range use. Plans to measure the effects of varying intensities of grazing on welfare and gains of both cattle and sheep on an adequate scale depend upon a cooperative arrangement with livestock owners yet to be worked out. The degree of range use and methods of management that will facilitate economical and stabilized livestock production consistent with maintaining the welfare of vegetation and soil will be the principal objective of the plan.

Leon C. Hurtt, E. H. Dobrinz, in cooperation with the Office of Range Management and the Forest Supervisor.

(1) Recorded series of phenological measurements, rather than mental averages, beside giving sounder figures have shown adjacent plant development plots to be comparable and intensity of use effects to be still unapparent upon height growth. (2) though Variability between different experienced men charting the same quadrat within the period of a month may be as much as 100%.



	No. men	Range Investigations obtained-80. Co.	Range 1
FINANCIAL PROJECT:		2310, 3123, 4248, 4262, 4770	108
WORK PROJECT:		221, 235, 245, 252	14
RESEARCH PROJECT:		Management Short-grass and Summer Ranges:	11
		Methods in Plant Ecology	8

SCOPE: 1. As a subproject under the short-grass and summer range management projects, evaluation of adequacy of the ecological methods now used in range studies. 2. The devising of improvements in methods and procedures, and the testing of new methods for separately for short-grass types, bunch-grass types, and brush types. (3) Estimation of quadrats

STATUS: A new line of work. Some preliminary work was done at Miles City in the summer of 1935 to determine: (1) adequacy of the plant development setup; (2) errors involved in charted quadrats; (3) accuracy of quadrat estimation; (4) workability of point-analysis method; (5) adequacy of major estimate-plots; and (6) usefulness of frequency methods.

RESULTS OF PAST YEAR: (1) Recorded series of phenological measurements, rather than mental averages, beside giving much sounder figures have shown adjacent plant development plots to be comparable and intensity of use effects to be still unapparent upon height growth. (2) Although Variability between different experienced men charting the same quadrat within the period of a month may be as much as 100%.



<u>Quadrat</u>	<u>No. men charting</u>	<u>Areas obtained-Sq. Cm.</u>	<u>Range: %</u>
A	5	8310, 3123, 4248, 4262, 4770	106
B <sup>c</sup>	4	221, 235, 245 <sup>oo</sup> , 252 <sup>oo</sup>	14
B	2	745, 834	11
U-3	2	750, 797	6

- Four-tenths of quadrat only.
- Same man. Range = 3%

Variation tends to be greater with large than with small areas. The errors in quadrat charting together with its costliness, emphasize the need for a critical study to determine more accurate and less expensive methods. (3) Estimation of quadrats by square decimeters, although twice as rapid as chart method, is also highly affected by subjective error. Estimates of two experienced men over 11 quadrats varied from complete agreement to 85% difference, and on one quadrat estimated twice by the same man, the larger estimate was 60% higher than the smaller. Estimates of large quantities seem to be more variable than small ones. (4) Laboratory tests of the point method show it to be an accurate and much more rapid method for quadrat chart compilation and give great promise of its direct usefulness in the field. (5) The major estimate-plot method, although apparently too crude to measure slight vegetative changes, seems a likely method to increase accuracy the random selection of small plots against the



of intensive reconnaissance. (6) Frequency studies give promise of being reliable guides in the selection of comparable areas for more intensive work.

PLANS FOR  
F.Y. 1937:

The variations in judgment of single observers and between different men in intensive work to be studied on a more adequate series of test quadrats at Fort Keogh and Vigilante: vertical photographs of the quadrats after clipping and lining to provide standards. In addition to others mentioned, the diameter-conversion method to be tried with a caliper reading directly in areas.

Adequacy of extensive methods to be tested to improve accuracy of range survey, the approach to be made through the major plot method, using area-estimates, diameter-conversions and point-analyses as supplementary methods and controls.

Uniformity and comparability trials to be made by means of frequency studies and point-analyses to determine: (1) necessary improvements in the cattle-range setup at Miles City, (2) an adequate series of samples for the sheep phase, and (3) a sounder basis for clipping studies.

A study to be made of the problems involved in obtaining truly random samples comparing, especially for application to plant development work, the random selection of small plots against the



**FINANCIAL**

**PROJECT:**

**ASSIGN-**

**MENT:**

**PROJECT:**

**RESEARCH**

**PROJECT:**

**SCOPE:**

**STATUS:**

**RESULTS  
TO DATE:**

random selection of single plants.

Lincoln Ellison.

Artificial Reseeding Investigations

Artificial Range Reseeding

To find cheap methods and the most promising species for reseeding plowed dry lands and depleted ranges and determine the extent to which artificial reseeding is practical on areas typical of several million acres of such land in eastern Montana.

Reseeding work was done on a small scale at the U. S. Range Livestock Experiment Station in the spring of 1932 and 1933 through the use of regular funds. A considerable expansion of this work took place from emergency funds allotted in the fall of 1935. Because of the uncertainty as to duration of this emergency money, the work has been organized primarily on a demonstration and extension rather than a research basis. About 1,300 acres have been seeded under this program, 150 acres of which was done last fall. This report is concerned mainly with the remaining 1,150 acres for which preliminary results are available.

Approximately 120 acres have been seeded on five national forests under a variety of methods, soil and seasonal conditions and about 120 acres



including repetitions at the U. S. Range Livestock  
FINANCIAL PROJECT: Range Investigations  
WORK PROJECT: Artificial Reseeding Investigations  
RESEARCH PROJECT: Artificial Range Reseeding

SCOPE: To find cheap methods and the most promising species for reseeding plowed dry lands and depleted ranges and determine the extent to which artificial reseeding is practical on areas typical of several million acres of such land in eastern Montana.

STATUS: Reseeding work was done on a small scale at the U. S. Range Livestock Experiment Station in the spring of 1932 and 1933 through the use of regular funds. A considerable expansion of this work took place from emergency funds allotted in the fall of 1933. Because of the uncertainty as to duration of this emergency money, the work has been organized primarily on a demonstration and extension rather than a research basis. About 1,300 acres have been seeded under this program, 150 acres of which was done last fall. This report is concerned mainly with the remaining 1,150 acres for which preliminary results are available.

Approximately 120 acres have been seeded on five national forests under a variety of methods, soil and seasonal conditions and about 120 acres



including repetitions at the U. S. Range Livestock Experiment Station. Approximately 910 acres have been reseeded under cooperative agreements with about 45 cooperators on privately owned land in 25 Montana counties, mainly in the eastern and southern sections of the state. Most of this work has been done on plowed and abandoned land but small trials have been made on range land depleted by overgrazing or other abuse.

Plans for testing crested wheatgrass in comparison with native grasses through grazing records on yearling steers have been only partially carried out because of failure during both 1934 and 1935 to secure a satisfactory stand of crested wheatgrass on the field designated for that purpose.

RESULTS  
TO DATE:

Probably two more unfavorable seasons could not have been selected for such trials than 1934 and 1935 have proved to be. With only 5.51 inches of precipitation, 40% of normal, 1934 was the driest in more than 50 years at Miles City while 1935 with only 6.28" or 46.1% of normal was the record dry year in more than half a century at Helena. Annual precipitation at Lewistown and Billings varied between 61 and 79 percent of normal during these two years. The 1935 drought was more severe in the central part of the state than was 1934. Unusually severe grasshopper infestations on numerous areas



seeded without prior soil preparation on land that was another handicap to success.

The very dry fall of 1935 made it impossible in numerous cases to distinguish between dormant and dead seedlings. This, together with work on the special range report, interfered with fall examinations on a few areas. Areas were classed as failures that did not show, from the best information available, an average of two or more live seedlings per square yard.

The following figures on success are very conservative and subject to correction after examinations are made under more favorable circumstances. fall seeding for dry seasons such as the past two.

Crested wheatgrass	734 acres	31% successful
Slender wheatgrass	29 "	25% "
Mixtures	177 "	10% "
Smooth brome	84 "	7% "
Yellow Sweet Clover	19 "	5% "
Tall oatgrass	11 "	4% "
Meadow fescue	60 "	2% "
Other species	37 "	0% "
Total all species	1151 "	23% "

The above does not include any estimate for about 150 acres seeded in the fall of 1935.

Since a cheap method was one of the primary objectives of the work about 75% of the acreage was productivity and under drought conditions, when two



PLANS FOR  
N.Y. 1937:  
seeded without prior soil preparation on land that was once plowed but abandoned from one to several years. A few comparative areas were seeded on prepared soil. With some exceptions, better results were secured in the absence of soil preparation. Further comparisons are needed before final conclusions about seeding without soil preparation are warranted.

Successful stands of crested wheatgrass were noted on 39 percent of the 290 acres seeded in the fall as compared to 26 percent on about 444 acres seeded in the spring, which is a good argument for fall seeding for dry seasons such as the past two. Most of the crested wheatgrass has been drilled in rows 12 inches apart at the rate of 3 to 5 pounds per acre which appears to give satisfactory control of weeds. This gives cheaper costs than 6-inch rows.

ASSIGN-  
MENT:  
Further work is warranted, especially with slender wheatgrass, smooth brome, yellow sweet clover, Harbin lespedeza, and a few others, but crested wheatgrass has given convincing proof of its superiority and outstanding ability to survive under drought conditions. The very high price of 50 cents or more per pound for crested wheatgrass limits the extent to which private owners can use it with profit for range reseeding, especially on lands of low productivity and under drought conditions, when two



or more trials may be required to get a stand.

PLANS FOR  
F.Y. 1937:

It is the plan to continue examinations and records on areas already seeded. Spring seeding

will be done on a number of these cooperative areas

for comparisons with fall seeding, but few or no

new cooperative areas will be established in 1936.

The plan is to place less emphasis on the extension

and demonstration phases and more on detailed re-

search in an effort to get more specific data as to

the best time and rate of seeding, depth of cover-

ing seed, etc. This work can best be handled under

carefully controlled conditions with small plots

and necessary replications. These plans are con-

tingent upon additional funds. A working plan is

in course of preparation with this change in view.

A new position, preferably of the associate grade,

will be required to carry this plan into effect.

ASSIGN-  
MENT:

Leon C. Hurtt with new associate grade man  
assisted by Woolfolk in cooperation with the Bureau

of Animal Industry at the U. S. Range Livestock

Experiment Station.

PLANS  
F. Y.  
1937:

Regular plot examinations in conditions 1 and 2, 1937.  
Studies; light under overwood, and natural regeneration  
after burns. Complete manuscripts and write one new  
(Davis) on increment of seed trees. Urgent to obtain  
Ribes ecologist to apply blister rust findings to

methods of cutting-173-

ASSIGN-  
MENT:

L. C. Hornby and A. P. Davis.



FINANCIAL  
PROJECT:

Forest Management Investigations.

WORK  
PROJECT:

Silvicultural Investigations.

RESEARCH  
PROJECT:M-1. Western White Pine; Removal and Regeneration.

## SCOPE:

Forms of removal; cutting, fires, epidemics. Considerations; seed-trees (species, seed-production, dissemination); seed-bed material in relation to moisture, temperature, light and root competition. Determine methods of cutting and slash disposal that most economically produce conditions near optimum for regeneration and that minimize ribes development.

## STATUS:

## STATUS:

RESULTS  
OF PAST  
YEAR:

(1) Clear-cut, shelterwood, seed-tree and selective methods studied in strips on 32 cut-over areas. (2) Cut-over and burned areas (34) studied in permanent plots by reproduction quadrats, seed traps and tagged trees. (3) Intensive study in sowed quadrats of factors controlling initial establishment.

RESULTS  
OF PAST  
YEAR:

Manuscripts: Haig and Wellner on 1 nearly complete; of Haig on 3 accepted for publication; partial manuscript on white pine silviculture. Four permanent plots in pre-logging removal of low-value species, two in girdled hemlock. Three alternating clear-cut and mature stand strips. Increment studied in 89 seed trees logged 20 years after first cut. in micrographed

PLANS  
F. Y.PLANS  
F. Y.  
1937:

Regular plot examinations in conditions 1 and 2. Studies; light under overwood, and natural regeneration after burns. Complete manuscripts and write one new (Davis) on increment of seed trees. Urgent to obtain Ribes ecologist to apply blister rust findings to methods of cutting.

ASSIGN-  
MENT:ASSIGN-  
MENT:

L. G. Hornby and K. P. Davis.



RS-NRM

FINANCIAL

PROJECT: Forest Management Investigations.

WORK

PROJECT: Silvicultural Investigations.

RESEARCH

PROJECT: Mt-1. Western White Pine; Reproduction Stands.

SCOPE:

Reproduction development to sapling size on different sites in natural stands and when weeded to different degrees and according to different methods. Study in permanent and semi-permanent natural and treated plots. Purposes; economy in weeding operations, altering of species composition and growth-rate. An important phase of producing maximum value per acre.

STATUS:

With CCC labor large scale weeding operations by Forests and by station at Deception/Creek Branch.

RESULTS  
OF PAST  
YEAR:

Indications; stand must be old enough to have dominance evident; 10-20 year age best to accomplish uniform spacing of high-valued species; cost of weeding older stands increases rapidly with age. Total of 21 permanent and 17 semi-permanent plots established in stands of varying composition, age, and amount of overwood. Much photographic and factual evidence assembled. Manuscript on young stand phase of stand improvement written.

PLANS  
F. Y.  
1937:

Completion of stand improvement manual in mimeographed form for 1936 field use and revision (1937) for publication. New plots contemplated for sampling condition not yet covered. Emphasis on collection of factual data for manuscript.

ASSIGN-  
MENT:  
MENT:

L. G. Hornby and K. P. Davis.  
L. G. Hornby and K. P. Davis.



FINANCIAL  
PROJECT:

Forest Management Investigations.

WORK  
PROJECT:

Forest Management Investigations.

RESEARCH  
PROJECT:

Silvicultural Investigations.

RESEARCH  
PROJECT:

Silvicultural Investigations.

## SCOPE:

Mt-1. Western White Pine; Age, Poles to Mature.

## SCOPE:

Development of stands older than saplings. On different sites study natural development and results of applying different methods and degrees of intermediate cuttings, including pruning. Purpose, to produce as economically as possible greatest value-growth-rate. Considerations: no sale for trees cut; their disposal and fire control. Is mid-summer moisture a limiting growth factor? Does thinning from above or from below conserve water best?

## STATUS:

Total plots 37, one a 16 subplot latin-square. At Priest River Branch, in 55-year stand, 4 plots established 1914, 4 in 1919, 2 in 1925, 1 in 1926, 7 in 1933 and 1 in 1934. At Deception/<sup>Creek</sup> Branch in stands 20-65 years, 1 plot in 1925, 8 in 1933, 6 in 1934, and 3 in 1935. Five-year measurements required, all made (4 in 1935, underlined) and compiled.

RESULTS  
OF PAST  
YEAR:

Above 5-year measurements, and additional heights taken in Deception latin-square.

PLANS  
F. Y.  
1937:

Priest River Branch; report on 1914-1919 plots and new plots for cedar understory development in thinned 75-year white pine. Deception Branch; 6 new plots to complete series in random 3 block arrangement in

ASSIGN-  
MENT:

hemlock-suppressed 60-year stand; complete Davis' statistical analysis manuscript on height-diameter curves in latin-square subplots.

ASSIGN-  
MENT:

L. G. Hornby and K. P. Davis.



RS-NRM

FINANCIAL

PROJECT: Forest Management Investigations.

WORK

PROJECT: Silvicultural Investigations.

RESEARCH

PROJECT: M-2. Ponderosa Pine: Removal and Regeneration.

SCOPE:

Forms of removal; cutting, fires, epidemics. Considerations; seed trees (species, seed-production, dissemination); seed-bed material in relation to moisture, temperature, light and root competition. Determine influences of natural stand removal on factors of natural regeneration. Determine methods of cutting and slash disposal that most economically produce conditions near optimum for regeneration.

STATUS:

Three selective logging plots established 1932 at Greenough, Montana. A cooperative project between Station divisions of Silviculture and Products, Region's division of Management, State and private agencies. Silviculture responsible for periodic measurements.

RESULTS  
OF PAST  
YEAR:

Annual examination of 50 reproduction quadrats and mortality of reserved trees. Heavy mortality due to insects; least in vigorous seed-trees left.

PLANS  
F. Y.  
1937:

Continue annual examination as above. rings made by CCC's winter 1933 and 1934; the other

ASSIGN-  
MENT:  
1937:

L. G. Hornby.

Completion of report on foster plots.

ASSIGN-  
MENT:

L. G. Hornby.



RS-NRM

FINANCIAL

PROJECT:

WORK

PROJECT:

RESEARCH

PROJECT:

SCOPE:

STATUS:

STATUS:

RESULTS  
OF PAST  
YEAR:

RESULTS  
OF PAST  
YEAR:

PLANS  
F. Y.  
1937:

PLANS  
F. Y.  
1937:

ASSIGN-  
MENT:

ASSIGN-  
MENT:

Forest Management Investigations.

Forest Management Investigations.

Silvicultural Investigations.

Mt-1. Western White Pine, Growth and Yield.

Mt-2. Ponderosa Pine; Age, Poles to Mature. to work out

Development of stands older than saplings. On differ-  
ent sites study natural development of stands and, of  
results of applying different methods and degrees of  
intermediate cuttings, including pruning. Purpose to  
produce as economically as possible greatest value-  
growth-rate. Considerations: no sale for trees cut,

total of 54 permanent and 56 semi-permanent plots,  
their disposal and fire control. Is mid-summer  
moisture a limiting growth factor? Does thinning  
from above or from below conserve water best.

Plots thinned 7, natural check-plots 2, established  
1933 with CCC's on Mill Creek administrative site of  
Lolo Forest, in dense 50-year stand. By Custer For-  
est personnel 6 thinning plots established 1918 and  
1921. All compilations complete

With CCC's near their Ninemile camp 3 plots, each  
divided into 4 subplots established 1935 in 30-year  
stand; 2 of these plots sample large area of thin-  
nings made by CCC's winter 1933 and 1934; the other  
is natural check-plot. All data compiled.

Completion of report on Custer plots.  
study of cedar pole growth in white pine stands. See  
L. G. Hornby.

L. G. Hornby and E. P. Davis.



## FINANCIAL

PROJECT: Forest Management Investigations.

PROJECT: Forest Management Investigations.

## WORK

PROJECT: Mensuration Investigations.

PROJECT: Mensuration Investigations.

## RESEARCH

PROJECT: ME-1. Western White Pine, Growth and Yield.

## PROJECT:

SCOPE: To improve present normal yield tables, and to work out

SCOPE: Study growth, and prepare normal yield tables. Work

application of them to natural stands. A long period

study, on permanent and semi-permanent sample plots, of

growth and development of understocked and fully stock-

STATUS:

ed stands from youth to maturity. Includes yield

studies in white pine stands with associated species

mixed in different ages and percentages.

STATUS:

Total of 34 permanent and 56 semi-permanent plots,

established mostly between 1922 and 1926. Remeasure-

ment at 5 and 10-year intervals. Two plots devoted to

growth in overmature stands and one to growth in almost

pure cedar. One pair of plots to indicate effect of

pruning on yield. Remainder in immature white pine

stands. Normal yield bulletin published 1932.

## RESULTS

OF PAST

YEAR:

All scheduled measurements made (5 permanent plots and

25 semi-permanent in 1935). All compilations complete

and summarized. One new thinning check plot to serve

also as yield plot.

## PLANS

F. Y.

1937:

Scheduled remeasurements on 4 permanent plots and 31

semi-permanent plots. Progress study and report on

permanent and semi-permanent growth and yield plots

needed and contemplated. Progress in application

study of white pine yield tables to mixed stands con-

templated through cooperation with Forest Survey making

study of cedar pole growth in white pine stands. See

"Survey" project.

## ASSIGN-

MENT:

## ASSIGN-

MENT:

L. G. Hornby and K. P. Davis.



RE-NRM

FINANCIAL  
PROJECT:

Forest Management Investigations.

WORK  
PROJECT:

Mensuration Investigations.

RESEARCH  
PROJECT:

ME-2. Ponderosa Pine; Growth and Yield.

SCOPE:

Study growth, and prepare normal yield tables. Work out application of these tables to natural stand conditions.

STATUS:

Temporary plots totalling 155 in Region One and 31 in the Black Hills of Region Two measured in even-aged stands during 1932 and 1934 for inter-regional yield study--tables to be prepared by the Northwest Station. Volume measurements were taken in 1934 on 173 trees

RESULTS  
OF PAST  
YEAR:

in even-aged stands 35 to 125 years old. Three permanent sample plots, one of which was pruned, were established in 1933 with CCC help near Frenchtown, Montana. In addition, two plots established 1933 near Frenchtown, Montana, as checks for thinning plots will serve as permanent yield plots.

RESULTS  
OF PAST  
YEAR:

One plot established near Ninemile, Montana, CCC camp as a check for thinning plots will also serve as a permanent yield plot.

PLANS  
F. Y.  
1937:

Approximately 110 of the temporary sample plots taken in Region One for inter-regional yield study require staking as semi-permanent plots to be measured at 5 or 10-year intervals and require the making of establishment reports.

ASSIGN-  
MENT:

ASSIGN-  
MENT:

L. G. Hornby.



FINANCIAL  
PROJECT:

Forest Management Investigations.

## WORK

## PROJECT:

Mensuration Investigations.

RESEARCH  
PROJECT:ME-3. Larch-fir Growth and Yield.

## SCOPE:

Study growth and prepare normal yield tables. Work out applications to natural stands of mixed species. Study growth of residual stands and for them prepare yield tables.

## STATUS:

Date 3/4 compiled for 86 temporary plots studied 1932 and 1934, logged 25-35 years before. Data compiled from 5-year measurements in 4 permanent yield plots established at Priest River Branch (larch, 1 in 1916; Douglas fir, 1 in 1916, and 2 in 1926).

RESULTS  
OF PAST  
YEAR:

Two 5-year plot measurements and compilations. By "Survey" personnel (See Growth Phase), for construction of yield tables, measurements made in 150 temporary even-aged plots, from which 42 were selected as semi-permanent. As part of "Survey's" application study volume tables made from strip tallies and individual tree measurements. Yield data analyzed, tables prepared, and study completed.

RESULTS  
OF PAST  
YEAR:PLANS  
F. Y.  
1937:PLANS  
F. Y.  
1937:

Two 5-year plot measurements (1 larch, 1 fir). Report on permanent plots. Compilation and report for residual stands. Further application studies by Survey.

ASSIGN-  
MENT:

Silviculture: L. G. Kornby and E. P. Davis.

Survey: L. J. Cummings on yield tables.

ASSIGN-  
MENT:

Silviculture: L. G. Kornby, and E. P. Davis.

Survey: L. J. Cum-181-



FINANCIAL  
PROJECT:

Forest Management Investigations.

WORK  
PROJECT:

Mensuration Investigations.

RESEARCH  
PROJECT:ME-4. Western Red Cedar; Growth and Yield.

## SCOPE:

To determine yield per acre in associations, and growth rate of western red cedar, particularly in the form of poles. Because this species always occurs in mixture and usually as an understory tree, it is necessary to study its yield in relation to total yield on any area. Its very high value in the form of poles, and the almost complete lack of information on its silvicultural possibilities and relations to the major types in which it grows, indicate the need for immediate investigations.

## STATUS:

New project. Data on some phases available in measurements of cedar on 15 western white pine thinning and

RESULTS OF  
PAST YEAR:

yield plots and on one cedar yield plot at Priest River Branch dating back to 1914.

RESULTS  
OF PAST  
YEAR:

None. Blocks of 1933 and 34; blocks surveyed and plotted.

PLANS  
F. Y.  
1937:

In cooperation with "Survey" (Growth Phase, See Project Plans) arrange to inventory all growth on selected plots that contain different percentages and ages of western red cedar. During winter of 1936-37 compile for use of "Survey" and to indicate what further field studies are needed. See Mt-1 sheet. New plot series contemplated at Priest River Branch in 75-year white pine to study effect of thinning on development of cedar understory.

ASSIGN-  
MENT:

Silviculture: L. G. Hornby, and K. P. Davis.

Survey: L. J. Cummings.



## FINANCIAL

PROJECT: Forest Management Investigations.

## WORK

PROJECT: Forest Regeneration Investigations.

## RESEARCH

PROJECT: Botany; Arboretum, Geographic Races, Phenology.

## SCOPE:

(1) Arboretum (200 acres) at Priest River Branch is testing 40 exotic and non-native species in blocks of 1/4 to one acre. (2) Plantations grown from ponderosa pine seeds of 21 widely separated U.S. localities established in 1911 to compare geographic races. (3) Thirteen phenological stations established in 1928 annually report seasonal vegetative events in four major forest types.

## STATUS:

Geographic races plots examined and reported upon by Kempff in 1927. Five-year phenological data partially compiled in 1933. Survival records of staked roses on 500

## RESULTS

RESULTS OF  
PAST YEAR:

(1) Fifteen new arboretum blocks planted, and 15,000 trees replanted in fail places resulting from severe droughts of 1933 and 34; blocks surveyed and platted. (2) Report on geographic races being prepared for publication following 1935 measurements and compilation of height, diameter, and survival records. Striking differences exist in volume of foliage, needles per sheath, needle length, persistence. Internal of Itane needle structure differences studied in cooperation with University of Montana.

## PLANS

F. Y.

1937:

## PLANS

F. Y.

1937:

(1) Arboretum planting in 10 new blocks and fail-places planned. Phenological observations continued.

ASSIGN-  
MENT:

R. H. Weidman.



FINANCIAL  
PROJECT:

Forest Management Investigations.

## WORK

## PROJECT:

Forest Regeneration Investigations.

RESEARCH  
PROJECT:Forestation; Influences on Survival in Plantations.

## SCOPE:

Because of low average survival and erratic behavior, studies contemplated: (1) soil structure, moisture, organic life and nutrients at existing and proposed planting sites. In cooperation with Region at Savenac Nursery and during regular planting operations study (2) class of stock; (3) season of planting; (4) methods of handling stock; and incidentally (5) spacing and (6) mixed species. previous work.

## STATUS:

STATUS:  
OF PAST  
YEAR:

New project. Reports available of early work by Wahlenberg and others in this region. After the

RESULTS  
OF PAST  
YEAR:

Analyses made of survival records of staked rows on 500 plantations shows 38 percent of trees alive after 5 years in 60,000 acres planted since 1909; 10 percent higher survival in spring than fall planting; dry early springs correlate with high survival and vice versa. Field inspection of plantations made with Regional Planting Chief.

PLANS  
F. Y.  
1937:

If funds available employ trained specialist to study Item 1. Prepare working plan in cooperation with Office of Planting. During spring and fall planting establish staked rows identifying different treatments in study of Items 2, 3, and 4. Hornby complete manuscript on survival in plantations 1909-1935.

ASSIGN-  
MENT:

R. H. Weidman and L. G. Hornby.

ASSIGN-  
MENT:

R. H. Weidman.



## FINANCIAL

PROJECT:

Forest Management Investigations.

WORK

PROJECT:

Forest Regeneration Investigations.

RESEARCH

PROJECT:

Forestation; Brushfield Planting and Seeding.

SCOPE:

In the St. Joe Forest 200,000 acres of privately logged and burned white pine land donated to the Forest Service carries a dense brush cover and little reproduction. Its loess soil, continuous from that of the adjacent Palouse grain country, is probably the most productive in Region One. The problem is to ascertain desirable planting or sowing methods.

STATUS:

New project. No previous work.

RESULTS  
OF PAST  
YEAR:

In cooperation with the Region and Forest work was begun on a 75-acre project in October. After the area, now enclosed by a bulldozed fire line, is

STATUS:

burned, it will be planted. By bulldozer parallel strips were cleared of root competition on 8 acres, half outside the fire line. Trees will be planted in these strips and in uncleared check rows. At

RESULTS  
OF PAST  
YEAR:

Priest River Branch a bulldozed fire line was completed around a 6-acre project.

PLANS

F. Y.

1937:

PLANS

F. Y.

1937:

In cooperation with Region revise preliminary working plan; plant in fall (1936) after spring completion of stripping at Priest River Branch and burning of both areas. Obtain toothed blade for bulldozer work if possible.

ASSIGN-  
MENT:ASSIGN-  
MENT:

R. H. Weidman.